

COAL AGE

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*Devoted to the Operating, Technical and
Business Problems of the
Coal Mining Industry*

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Editor

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Budgets, Bankers and Management

FOR many years bankers, called upon to make commercial loans or to sponsor bond issues, were content to be guided by balance sheets and profit-and-loss statements. This appeared to be satisfactory until the difficult business year of 1921, when expanded inventories and frozen assets brought them sharply to a critical viewpoint on loans. In order to protect equities banks were required in many cases to have personal representatives participate in the active management of these enterprises.

AS a direct result of this experience bankers began to require that detailed budgets be prepared, setting forth normal expectancies for the business. This was not all; they insisted that once a budget of operations had been set up machinery be provided by which definite control of income and outgo might be effected. In many cases it was strong medicine, but both physician and patient benefited. Bankers got a new viewpoint of the fundamental principles of modern business management. This gospel spread among the fraternity. As a result responsible bankers are better able today to appraise the performance of management than they were ten years ago.

BUSINESS concerns that went through this period of rebuilding not only learned the importance of budgetary control but came forth stronger for the experience. They learned, among other things, that it is fatal to attempt to operate without a definite

plan. They found also that mass production for the sake of volume, without reasonable profit, is deadly.

IN ALL of this there is a lesson for the coal industry. Nowhere is there greater need for budgetary control. In no industry is it more necessary to co-ordinate production and consumption. Somehow the industry always has been able to find capital, and frequently too much capital. When depression cast its shadow Lady Luck, in the form of a strike or a car shortage, came to the rescue. Those days are past. Success in the future is much more likely to rest on the intelligence and alertness of management. Costs will be known with a new degree of accuracy. Markets will be studied in the light of modern technique. Irrespective of whether operators resort to the banks or to the public for financing, they will prepare and use regularly budgets that will pass the closest scrutiny. Operating methods will be improved constantly. Costs will be stabilized and coal will not be sold below cost of production.

WHEN this is done consumers will have more respect for the industry. Securities of coal companies will achieve a new position in the market place, and we shall hear less of legislation and more of prosperity. In such a program financial institutions, railroads, public utilities and other consumers of coal may well lend the weight of their influence toward ultimate stability.



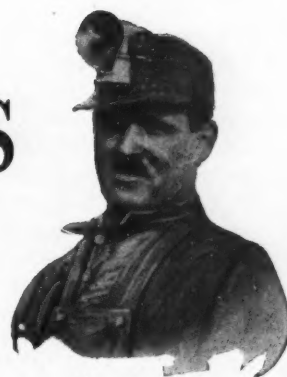
Taking on Coal at Buenos Aires

*From a Painting by
Benito Quinquela Martín*



MAN VALUES

A Neglected Phase of the Coal Problem



By H. S. Gilbertson

Director of Personnel
Lehigh Coal & Navigation Co.

IN AN interview not long ago Alfred P. Sloan, Jr., president of the General Motors Corporation, gave utterance to certain more or less casual remarks which in various quarters of the business world would be regarded as heretical and revolutionary: "I never issue orders;" and again: "the day of the one-man organization, in my opinion, is over." This, in an age which has come to think of industrial achievement in terms of Harriman and Hill, Gary and Ford.

While Mr. Sloan probably was thinking more specifically of the higher strata of the executive staff, the evidence of actual results goes to show that the same underlying thoughts would apply throughout the organization and its many subsidiaries. It is quite evident, in other words, that General Motors has succeeded in enlisting not some tens of thousands of "hands" but an equal number of co-operating intelligences and loyalties. This enlistment has reflected itself to such a degree in the matters of production costs, profits and good-will as to baffle most competitors. Mr. Sloan said in a recent address:

After all, the tens of millions of dollars we may have in banks, the hundreds of millions of dollars invested in various ways, our plants and their equipment throughout the world, all is of comparatively little value without an intelligent and effective organization. It is easier to replace all the former than it is the latter.

ONE might suppose that Mr. Sloan would be tolerably busy at the great executive task of "shedding details." Thousands of minor matters he undoubtedly must delegate. But it is interesting to record one detail which he has not permitted to be shoved off upon subordinates. Mr. Sloan spends a great part of his time calling not, as might be supposed, upon "big people" but upon local dealers of the various units of the industry. He states that he has personally visited practically every

city in the United States on missions of this character, meeting people in their own places of business, talking across their own desks and soliciting from them criticisms and suggestions as to their relations to the General Motors Corporation, the character of the product, the corporation's policies. Thus does the head of the greatest of industrial enterprises exemplify the idea of man values.

IT HAS often been said that business would do well if it strived less to be efficient and more to be human. But the outstandingly successful industries which have made man-power a major interest and study go about the matter in no such sentimental frame of mind. They have no funds to squander on business frills; their objective is not philanthropy but profits; they are engaged in the very practical pursuit of making their organizations more efficient *because* more understandingly human.

How to enlist the *whole* man in the man or the hundreds or thousands of men who are working for you—or with you—this, it would seem, is the gist of the personnel problem in industry. When it shall be effectively solved it is no extravagance to say that industry will have discovered a principle fully as far reaching in its effects as mass production. Concerns like General Motors, the American Telephone & Telegraph Co. and the Dennison Manufacturing Co., to name just a few, have made substantial progress toward such a solution.

In the meantime, what is the coal industry doing? It has a man-power problem unique in importance and difficulty. Roughly, 70 per cent of production costs in both bituminous and anthracite hinges upon it; to which may be added a high local taxation

due to the necessity of maintaining large producing communities. But the story, to be complete, should be told also in terms of low morale and even open warfare.

The answer to which the industry has given greatest attention is mechanization; a real answer but a partial one, and an escape from the issue rather than an attempt at its mastery. Possibly, in the experience of the progressive industrial and public utility concerns such as those previously mentioned lies an answer fully as promising as mechanization, and perhaps even more constructive. The man-power problem will remain when the industry has been thoroughly mechanized and the weaker units have been eliminated.

The coal industry is not different from many others. It has not yet broken from a business tradition in which more attention is paid to placing limitations upon men than in expanding their possibilities. According to this tradition, every man in the ranks and in the lower executive strata looks like every other. The traditional organization has written all over it a slogan applicable to the man at the top, the man at the bottom, and all intervening executives: "Every man in his place, minding his own business." The miner whose work is bought at the established rate is expected to be a coal cutter, giving to the company his daily portion of physical labor at the appointed working place, and nothing else. The foreman is expected to keep coal on the move to the tippie or breaker; salesmen to keep in the field taking orders. Over all, a general executive to keep the parties to the business out of one another's wool. The main thought is on final "results."

UNDER favorable conditions this scheme of organization has worked. But it has proved far from equal to the special shocks and prolonged strains to which employee

relations in the industry have been subjected. I am not unmindful of the fact that the difficulties of the industry are mainly economic—traceable to differential in natural conditions, geographical situation, etc., which have resulted in overdevelopment. But there also are management differentials to be reckoned with.

The labor problem is not, primarily, that great and complex thing which comes up for wholesale consideration every now and then in interstate conferences. It is a matter of day-to-day individual relationships within each operating organization. Neglected, these relationships can easily contribute as much in many cases to the failure of the company as unfavorable freight rates or difficult natural operating conditions. On the other hand, progressive coal companies, to an even greater degree than most industries, may find in a patient, sincere and intensive study of their man-power a happy issue out of some of their chief troubles.

The coal industry has expected and accepted too little from its men. In times of extreme crisis it has keenly felt the need of points of contact other than through the pay envelop—it has cried out for co-operation and reasonableness.

BUT has it really laid any foundation for any such contributions of personal support? It has left to "outsiders" the responsibility for supplying food for thought or, more accurately, food for emotion; it is not surprising that such food has often been a stimulant for action which has subverted the best interests of everyone concerned. If the industry has been guilty of inhumanities, as is sometimes charged, it is mainly because, to adopt the phrase of Samuel Gompers, it has treated labor as a commodity rather than thought of its man-power as a body of human beings capable of thinking and feeling in harmony with the purposes of ownership and management.

It was a southern Illinois miner who first informed the writer that the sole qualifications for his job were a "strong back and a weak mind." Later on it appeared that this was something of a stock joke in the region, but a joke with a good measure of earnestness in it. Something is wrong with the industry or organization which breeds inferiority complexes in its men! It has stopped with the enlistment of physical labor, where it might also have captured individual sympathetic interest and un-

derstanding. * Hazardous and dirty though the work of a miner may be, it is far and away more creative and captivating than the dull routine of the average modern factory in a minute division of operation. Many miners of the better type actually think and talk about their work in their leisure hours.

When these instances are thought of as typical of possibly tens of thousands in the industry, the poverty of the industry in terms of employee and public understanding and good will is easily explained. Alfred Kauffman, president of the Link-Belt Co., recently wrote:

I am convinced that we are quite overlooking a factor which is right at hand in every plant: the co-operation of our workmen. The change has come about so gradually that we frequently overlook it, but the average workman today is vastly more aware than he used to be of what business is all about. We ought to take advantage of this to get his co-operation. It is there for the asking and a little encouragement. —*Factory*, February, 1928.

POSSIBLY there is an excess of optimism here; the process of "asking" in the coal industry may entail the laying of ground work that will represent years of effort. But the idea is right.

A glimpse of the possibilities of the modern viewpoint on man-power may be gained from a story contributed by E. K. Hall, vice-president of the American Telephone & Telegraph Co. The operating telephone company in a certain Western state had made a strong and well-supported plea for increased rates, based upon rapidly rising costs. It was actually losing money on the schedules then prevailing, but the state's Public Service Commission refused relief. Shortly afterward the employees of the concern came forward with an offer to accept a reduction in wages until the desired adjustment in rates could be brought about. There was no steering or manipulation on the part of the management to bring about this result.

It is so usual for conditions exactly the reverse of this incident to prevail in the coal industry that many, perhaps, feel the need of looking around the corner for an alibi. A favorite one, in the organized fields, is the union. But the truth lies rather deeper than that.

IT IS neither a secret nor a libel that the United Mine Workers, like nearly all trade unions, has found it to its advantage at times to undermine the proper relationships between men and management. This

policy, together with the doctrine of collectivism which discourages distinctive individual achievement, constitutes an obstacle to much that is advocated here. But only in a secondary sense is the union responsible for the deficient enlistment of man-power. It is necessarily a militant organization and, very naturally, has taken tactical advantage of any weaknesses of management which could be turned to its own uses. The ultimate blame rests upon management for having left the line unguarded at a vital point.

One of the finest exhibitions of man-power appreciation in the writer's experience was brought to light in the highly unionized coal fields of Illinois, with Thomas F. Moses, one of the outstanding figures in the industry, playing the leading rôle. Before his recent promotion, when he was still in charge of the extensive properties of the United States Fuel Co. in Indiana and Illinois, Mr. Moses made it a cardinal point to hold himself accessible at all times to every individual employee.

The mere statement of this policy suggests nothing particularly remarkable, but from all that his business associates, subordinates, miners and fellow townsmen have to say, it is quite evident that the sincerity with which it was carried out is largely responsible for Mr. Moses' success as an operating men. It is clear that he values man-power above machinery, not for publicity purposes but as a background for effective day-to-day management. Dealings with individual men are regarded as too important an executive duty to be delegated entirely to subordinates.

When the idea of putting the man ahead of the machine takes hold it ramifies into every corner of administration, whether it be in a factory or a mine. Things will be done for the sake of shaping the environment for better man-power performance and, behold, they turn out to be essentials of good administration. There is a coal mine in Illinois where the operating policy is built around the idea of "Service to the Man at the Face." External conditions and machinery are thought of as matters to be adapted to the possibilities of the man rather than that men should merely conform themselves to the requirements of a machine.

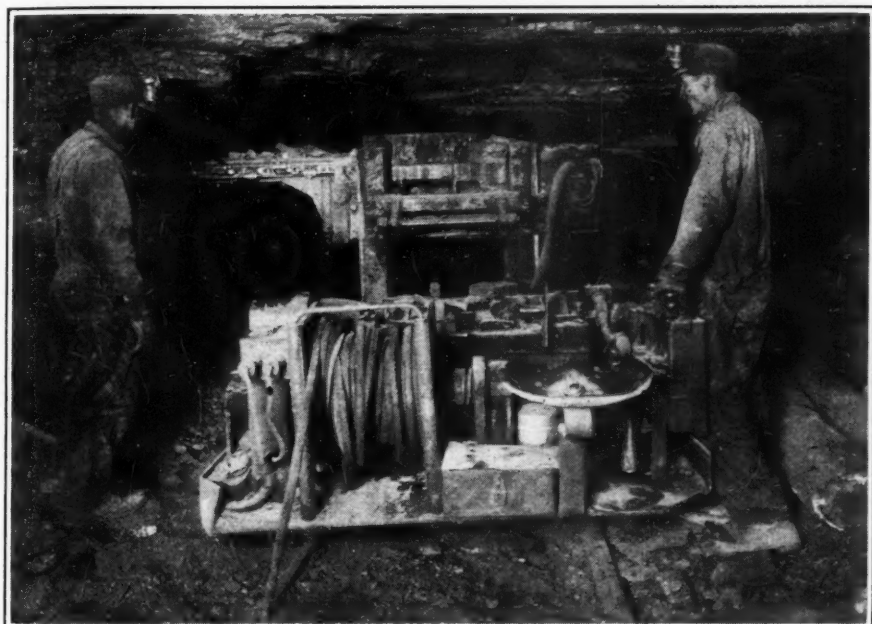
This point of view is fundamental. Specific measures for translating it into practical administration follow naturally. We shall deal with them in due course.

An Approach to COMPLETE MECHANIZATION

How It's Done in Two Kentucky Mines

By *A. F. Brosky*

Associate Editor, Coal Age



Overcutting Thick Slate on Long Face

NOT so long ago, when mechanical loaders and other comparatively new mining machines were first widely considered as tools promising relief from high operation costs and labor problems, the question immediately at issue was, Would they work—considered from a mechanical standpoint? It was soon found that the inherent functioning of these machines gave no great cause for worry and that their application to the work at hand was the big problem.

To the degree that labor effort and vigorous management methods have been applied the difficulty of the problem at hand has dwindled. The new machines were initially applied to the simplest of tasks and gradually their use has been extended.

Having displayed their fitness for the mining of rooms, mechanical loaders are now being applied to the winning of pillars. Cutting machines are being made to cut kerfs horizontally or vertically at almost any position in a seam of normal thickness. These machines are being

utilized successfully in the removal of thick and thin beds of impurities. Appreciably greater quantities of refuse may be handled at a much reduced cost rate, mechanically. Mechanical drills have advanced in use to the point where now they are being mounted in multiple on a truck. And the end of this mechanical development is not yet. Mechanization of mines is moving fast.

A clear reflection of this progress is given by the mechanization activities in Mines Nos. 205 and 206 of the Consolidation Coal Co., at Jenkins, in the Elkhorn field of Kentucky. In the first-mentioned mine in particular mining is intensely mechanized. If gathering of coal from the face in mine cars by locomotives may be termed, in the strict sense, a mechanical operation, then all of the major mining operations in the machine section of this mine are mechanized, for a thick parting of slate in the seam is overcut and also removed by a cutting machine; the slate, the quantity of which handled

is considerable, is loaded mechanically; the shotholes are drilled by power and the coal is loaded by machines.

In the section where mining has been mechanized in No. 205 mine the Elkhorn seam is divided by a thick slate parting into two benches, the upper being 3 ft. and the lower 4 ft. in thickness. From 12 to 14 in. of coal over and above the 3 ft. taken is left to hold the roof. This parting varies in thickness from 12 in. to a maximum of 52 in.

The hardness of the slate varies more or less with location; in general it would not be considered hard. However, its great thickness and difficulty of removal makes its presence in the seam a deterrent to economical mining by old methods. So much is this so that thrice since the mine was opened attempts to work the thick-slate area by hand methods have failed. The mining cost naturally was high and difficulty was experienced in getting men to work it. Mechanized methods permit mining of coal in this section in competition with hand operations in other sections of the mine where conditions are more favorable.

Rooms are driven 14 ft. wide and 300 ft. long on 90-ft. centers. Crosscuts, of the same width as the rooms, are turned on 90-ft. centers at a slight angle, leaving blocks which measure 75 to 80 ft. on a side. These blocks are recovered by open-end or slab cuts. Where the roof gives no trouble, two separate and distinct cuts may be taken each day from each of the blocks being mined—from the two sides nearest the gob.

Where conditions are less favorable a block may be attacked from one side only—that is, on the end facing the gob. Under still less favorable conditions the block may be split in

two from the last crosscut and each pillar-end face thus materially reduced in length. The length of a slab cut may vary between the limits of 25 and 80 ft.

A day shift and a night shift are required for the complete taking of a cut. The day crew prepares the coal for loading—cutting; removing and loading out the bug dust and slate parting; sweeping the floor, faces and kerf free of any particles of slate or other impurities; shooting and timbering. The crew on the night shift is employed primarily in the job of loading coal.

Removal of the slate parting is accomplished by two Goodman slabbing machines equipped with an 11-ft. bar. A kerf 7 to 7½ ft. deep is cut in coal directly over the parting. Then the slate is shot and later raked out by the slabbing machine. This is accomplished by operation of the cutter chain in conjunction with a swing of the bar across the face or with the machine tramping along the face, depending on whether a narrow place or a long face is being worked. During this operation the upper bench is supported by short props. These are kicked out by the cutter bar during the raking operation and reset after the machine has passed. The cutter bar rests on the top of the lower bench of coal during the raking operation.

Cutting of the coal is accomplished at low speed and raking of the slate usually is done at high speed, but where the pieces being removed from the kerf are exceptionally large the machine operates at low speed. A

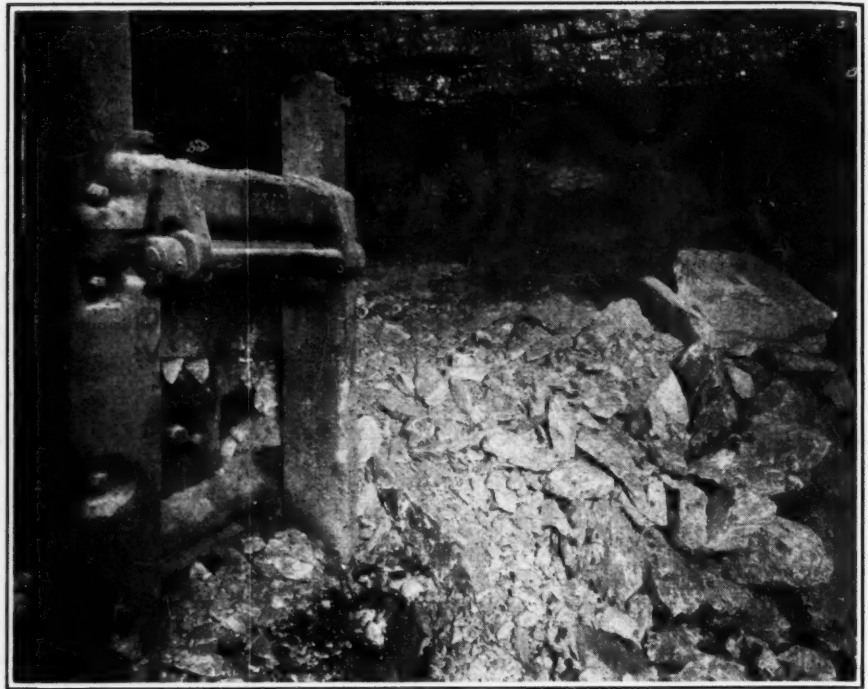
single sweep of the cutter bar through the kerf usually removes most of the slate, but where it is feasible, as in narrow places, a double sweep is made, in which case little of the slate is left for removal by hand. The slate in a parting 3 ft. thick in a 14-ft. place can be completely removed in this fashion in 11 minutes. The average thickness of parting handled in this way lies somewhere between 15 and 20 in. and 52 in. is the maximum thickness.

Ordinarily but one set of bits is required for each machine shift, both for cutting the coal and raking the

slate. Generally all places are cut before raking is attempted. However, for convenience sometimes the machines alternate between cutting and raking. It is not to be thought that the slate parting is of a crumbly nature or well broken by shooting. The pieces are fairly large, many of them much too big for ready removal by hand, and in places the slate is quite hard.

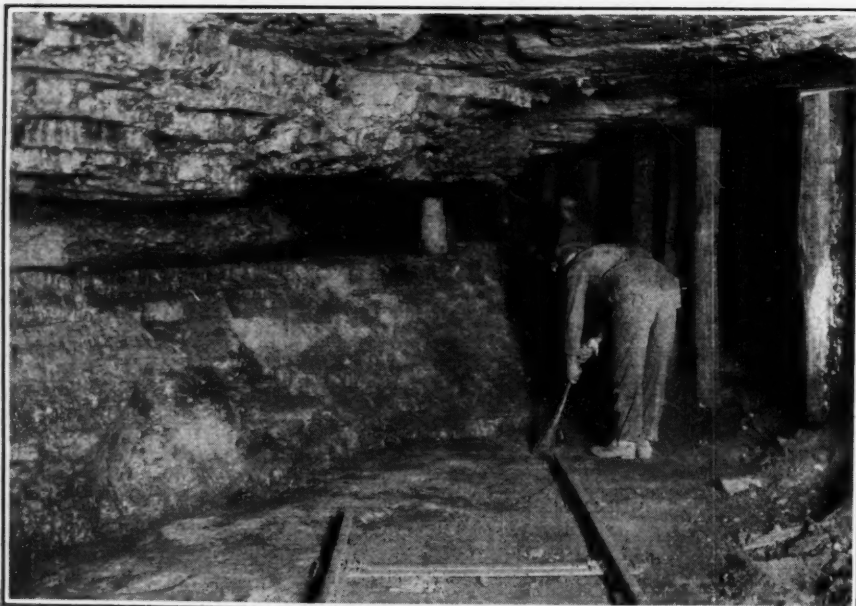
It would seem that the utilization of a cutting machine of this type might serve in the taking down of fragile roof in some instances. Where the roof material tending to come down is topped immediately overhead by a stratum of sufficient strength to resist the stresses set up by pop shots in the rock material below it, no doubt the method would prove advantageous. Certainly it would result in a cleaner product and at the same time eliminate much of the hazard due to falls of roof. But for the removal of hard, massive drawslate, such as occurs over the Pittsburgh seam, the method is hardly feasible. The cutter bar probably would be wedged in and held tight by the fractured slate above it.

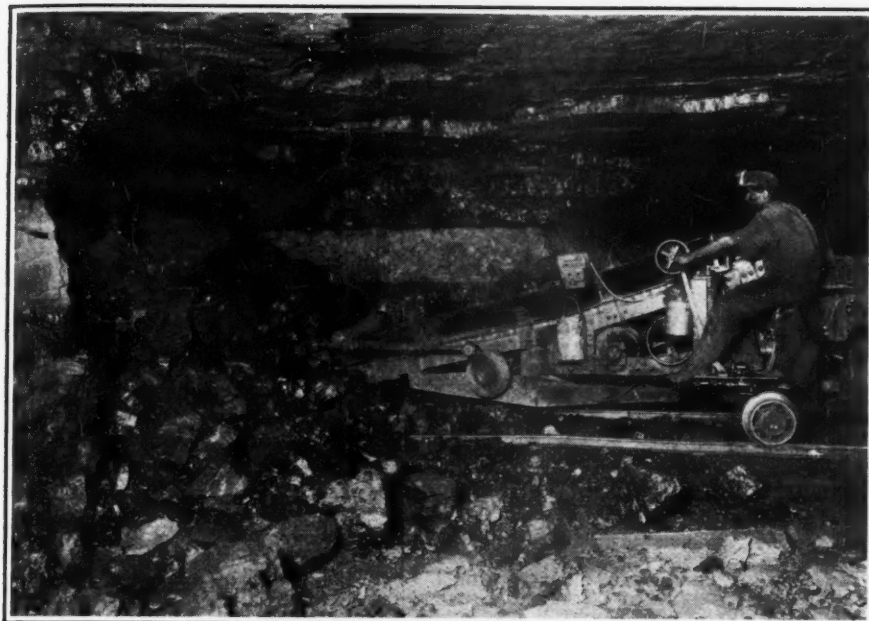
The slabbing machines, and the loading machines which follow them, work on 30-lb. rails on steel ties. This track is set in the middle of narrow places and about 4 ft. from coal on long faces. The position of the track for cutting and raking is not disturbed during the operation of loading slate.



Raking Out Slate in Thick Parting

Preparation on a Long Face





A Myers-Whaley Loading Coal

In the breaking up of the slate prior to raking it has been found that shooting up is better than shooting down, for the obvious reason that the upper bench of coal is thus not disturbed. Attempts at shooting down usually resulted in the fall of a part or all of the upper bench.

Holes for shooting of the slate are spaced at intervals of 4 to 5 ft. They are started in coal, at the top of the upper bench, and angled slightly upward so as to penetrate the parting at the back of the cut. In a heavy parting—say, 3 ft. thick—3 to 4 sticks of Gelobel (permissible) are placed in each hole. In a parting from 10 to 13 in. thick $1\frac{1}{2}$ to 3 sticks are placed in each hole. In a 14-ft. place four holes are drilled to the parting and three holes in each of the two benches of coal. Each of the holes in the upper bench of coal is charged with 2 to $2\frac{1}{2}$ sticks and in the bottom bench with $1\frac{1}{2}$ to 2 sticks. The coal is brought down by cushioned blasting, a 1-in. cartridge being used in a $1\frac{1}{2}$ -in. hole.

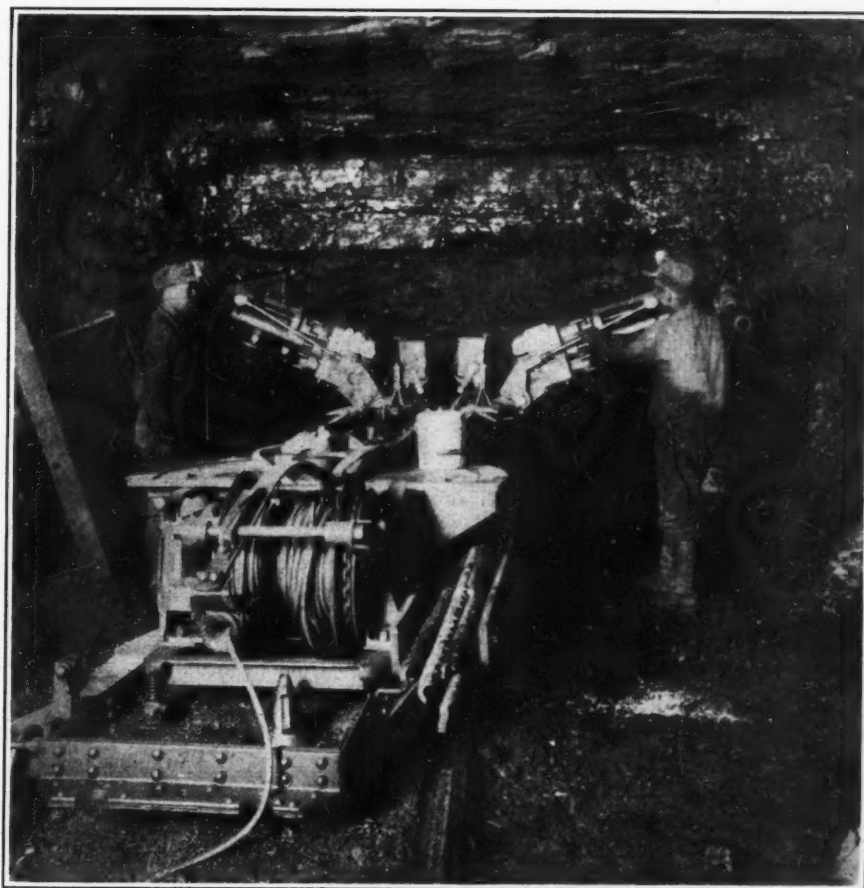
Both benches are loaded out simultaneously, and so bringing down of the top bench immediately follows shooting of the bottom bench. This is practicable because of the great thickness of the parting separating the two benches. In some instances, however, in this mine as in the No. 206 mine, only the bottom bench is shot during the day shift and the top bench is brought down progressively, shot by shot, as the loading machine moves across the face. Under certain conditions the latter practice gives a lumpier coal.

long faces are placed with a hand-held electric drill. This machine is mounted on a self-propelled truck, and being equipped with a cable reel, travels as does a mining machine—only at a considerably greater speed. It is provided with two drills which can be operated simultaneously.

With this machine holes can be drilled at any point within the area of a room face 24 ft. wide and 7 ft. high. The machine requires no loading or unloading. Arriving at a face the brake is set and the drills, which are mounted on double-jointed arms and turntables, are swung into position, quickly raised or lowered by power and locked in place. The drills may be swung around for drilling either rib in a narrow place. They also have the advantage of being capable of drilling a horizontal hole close to the roof or bottom. They will drill a 7-ft. hole in $1\frac{1}{2}$ to $2\frac{1}{2}$ minutes depending upon the characteristics of the coal. It requires 2 to 3 minutes for making ready for drilling and about the same period for preparing for moving.

Slate removed from the parting is loaded by use of Myers-Whaley machines, of which three are in service. These machines are double-shifted, being also employed for loading coal

Jeffrey Drilling Machine at Work



on the night turn. Practically all of the parting slate is loaded into cars and taken outside. As the track is only 4 ft. from the long faces much of it is buried by slate. Consequently the loading machines load end-on or at only a slight angle and little time is lost due to maneuvering. Perhaps an arrangement might be devised whereby the slate picked up by the loading machine could be transferred to an intermediate carrier and thus stowed in the gob, as is done at the mine of the Gay Coal & Coke Co., in Logan County, where a Jeffrey pit car loader serves in that capacity.

Meticulous care is exercised, as in all mines of the company in the Elkhorn district, in the removal of all refuse likely otherwise to contaminate the coal during shooting and loading. After the raking operation men called bug-dusters enter the kerf, pick down and sweep all loose pieces from the rock face; thoroughly sweep the top of the lower coal bench; sweep the face of the coal and lastly shovel and sweep the last traces of refuse left on the bottom by the loading machine. The roof is not a source of contamination since coal is left to hold it. By these measures the company is enabled to maintain its standard analysis of not more than 4 per cent ash, even though the coal is loaded mechanically.

Before a long face is shot the track is torn up and an advance row of timbers is set. The loading machine attacks the coal end-on and the track is extended in keeping with the progress in loading. Extensions of track are facilitated by the use of short lengths of rail and steel ties. As this work is done during car-shifting intervals it causes no delay.

A row of timbers on 5-ft. centers is set about 10 ft. from solid coal with the taking of every cut. The maximum diameter of these timbers is 7 in. None of them is recovered. Incidentally the thickness of cover over the machine-loading section is about 200 ft.

On the day shift for the three Myers-Whaley machines 46 men are employed—6 loading-machine runners, 15 bug-dusters, 6 haulage men, 4 track men, 4 timber men, 4 drillers, 4 cutters, 2 shotfirers and 1 foreman. On the night shift the crew consists of 22 men—6 loading-machine operators, 6 haulage men, 6 track men, 3 clean-up men and 1 foreman. The force of both crews combined consequently is 68 men.



Coloder on a Pillar End

The output of coal from this crew and the three loading machines averages about 130 tons per machine per shift. This is not low when it is considered that on an average two cars of slate are loaded for every three cars of coal loaded. The output of coal per man is about $5\frac{3}{4}$ tons per shift. The output of slate per man per shift runs a little higher, as the slate in two cars normally filled weighs more than the coal in three cars.

In the No. 206 mine there are two mechanical-loading sections. Conditions are more favorable here for mechanical loading than those in No. 205 mine, as the slate parting which characterizes the seam is only 3 to 6 in. thick. As in No. 205 mine, the seam is divided into benches of

about equal thickness, and 12 to 14 in. of top coal is left to hold the roof. The cover is about 200 ft. thick. In the one section three Joys are in operation and in the other two Coloders.

Both sections are laid out in the block system, by rooms and crosscuts 14 ft. wide on 90-ft. centers. The crosscuts are not staggered but are driven across the rooms in a straight line. This projection of crosscuts facilitates haulage and aids particularly in the shifting of cars to and from the loading machines. The plan is to drive rooms and crosscuts only as needed. Track is laid in every third room and in only those crosscuts where pillar mining is being done. At the time of my visit to this mine the Joy machines were engaged in open-end mining of room pillars adjacent to the block panel, where rooms are 15 ft. wide and 275 ft. long on 50-ft. centers.

The coal is prepared during the day shift and loaded at night. Cutting is done in the parting itself by Jeffrey arcwall machines equipped with a 10-ft. bar which cuts an 8-ft. kerf. After careful sweeping of the kerf, face and bottom, the bottom bench is shot and much of the coal thus loosened is removed before the top bench is brought down and loaded out one shot at a time.

In the narrow pillars the Joy machines load open-end. In the Coloder section the blocks are mined by a slabbing-cut attack on the two gob

(Turn to page 212)

Loading Bottom Bench with Joy Machine



W. M. MILLER *describes device that*

Copes With Uncertainty of Sectional Ventilation

THAT there is a trend to eliminate the unnecessary chances usually taken with sectional ventilation in gassy mines is indicated by W. M. Miller, of Coalwood, W. Va., in describing a signal and power-circuit controlling device the contacts of which are actuated by changes in air pressure.

"I have observed that in a mine which generates explosive gas," said

of the fan or to an airway in the mine. The brass rod which carries the round contact washers raises as the water gage increases and lowers as it decreases. The valve diaphragm has an area of 7.1 sq.in. A water-gage pressure of 1 in. is equivalent to 0.036 lb. per square inch. This figure multiplied by 7.1 gives $\frac{1}{4}$ lb. as the total lifting force of the diaphragm at 1 in. water gage.

"When the ventilation pressure is normal contacts *A* are bridged and contacts *B* are open. Contacts *A* are in series with the no-voltage release coil, or the operating coil of the automatic circuit breaker. Contacts *B* are in series with a bell or horn supplied by a dry cell or storage battery. When the ventilation pressure drops, the circuit *A* is broken, thus indirectly opening the power circuit to the mine, and at the same time circuit *B* is closed, thus sounding an alarm.

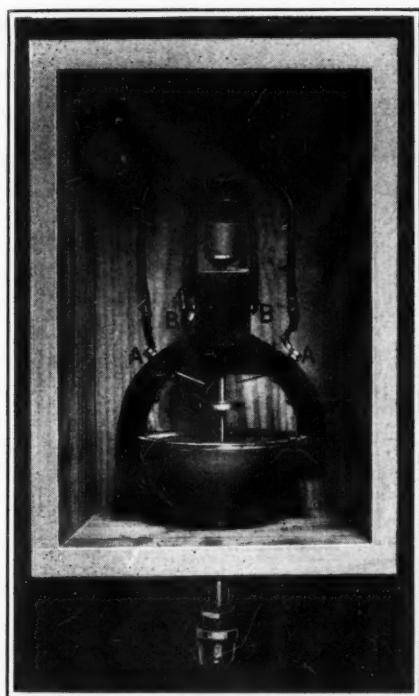
"My intentions are to install automatic circuit breakers on all cross entries, each to be controlled by one of these valves, so if ventilation ceases in a section, the power is disconnected. This would prevent locomotives or mining machines from running into the gas which accumulates and causes an explosion.

"The valve chamber and diaphragm of the contact device should be made large enough in diameter to obtain the required lifting force. The enclosing box should be kept locked and only the fireboss and electrician allowed to have keys. There would be connected in the circuit *A* a hand-reset relay which would hold open the control circuit through *A* until the relay was reset by the fireboss or electrician. This relay would be mounted in the same box with the contact device, and the combination would prevent the breaker from reclosing until after the section on which ventilation had failed had been examined by the fireboss and cleared of all accumulated gas. He would then reset the relay, which would permit the power circuit breaker to close."

Since penning the foregoing

description of his signal and power-circuit controlling device Mr. Miller has designed a time-limit relay to work in conjunction with it. Writing from Coalwood, W. Va., March 20, he states: "On this time-limit relay from one minute to any length of time desired can be obtained to admit a motor trip to pass through the door before the circuit is broken."

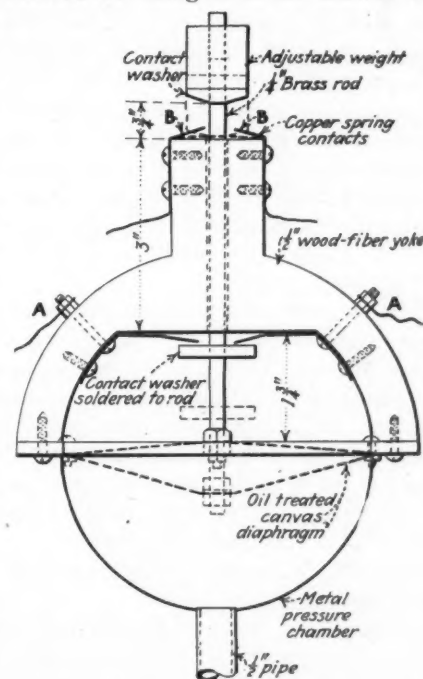
In a way this pressure contact device of Mr. Miller's and the proposed method of using it is an answer to



*Pressure Contactor Mounted in
Wooden Box*

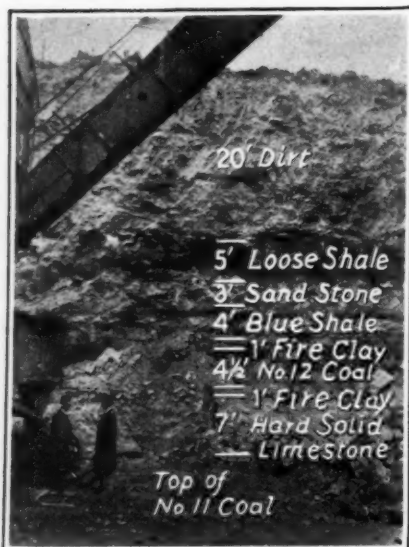
Mr. Miller, "power should be cut off the electric circuits and an alarm given if the fan is stopped, or if ventilation ceases in any air split which change would vary the pressure in a range of, say, 1 in. water gage." Referring to the photograph and sketch, Mr. Miller goes on to describe the construction and operation of the device.

"The valve chamber, which is 3 in. in diameter and is covered with a diaphragm of oil-soaked canvas making an airtight compartment, is connected by a $\frac{1}{2}$ -in. pipe to the windbox



*With Pressure in Chamber and
Diaphragm Raised*

the mine-door signal and control system advocated by J. H. Edwards in the March issue of *Coal Age*. Mr. Miller has worked out the design and construction details of the pressure contact device or valve. By proposing that one of the valves and a reclosing breaker be installed to supervise the ventilation and power on each split he attacks the important problems of what is to be done automatically and what action should be taken by mine employees when the lack of ventilation in a section becomes evident.



45-Ft. Cut Made by
Electric Shovel

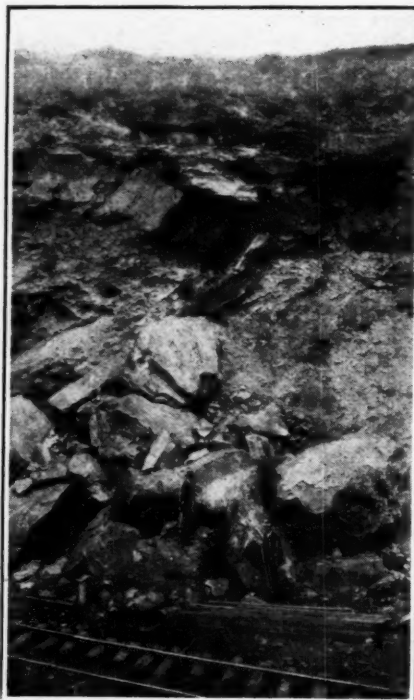
AS COMPARED to underground work, mining coal by removing the overburden is attended with fewer uncertainties. With good shovel equipment and a layout that takes care of surface water, a definite and uninterrupted output can be maintained. Dangers of roof caves, squeezes and of dust or gas explosions do not exist, and the labor situation is much different because of the fewer men employed.

In addition to several underground mines, operations of the Norton Coal Mining Co. in western Kentucky include five strip mines having a total output of 78,000 tons per month. Eight large stripping shovels are in use; seven of these are steam and one is electric. Overburden ranging up to 60 ft. is regularly removed to uncover the coal ready for operation of the loading shovels.

Except for some of the shovels in use when three of the strip mines were acquired, all of the stripping shovels are of the electric type. In stripping duty we have found that a year-round digging efficiency of 90 per cent can be maintained with the electric shovel, compared to 68 per cent with a steam shovel. In computing the efficiency the actual digging time is compared to the total shift time.

At Western mine, which is in Hopkins County, about five miles from Dawson Springs, a new five-track steel tippie equipped with picking tables and loading booms is now in operation. This tippie, which has a daily capacity of 3,000 tons, handles the output from an underground mine in the No. 9 vein and from a strip

mine in the No. 11 vein. Because the latter coal has been protected from surface action by a 7-ft. stratum of limestone and therefore is in perfect



Above—Large Boulders Resulting
From Dynamite Shot in 50-Ft. Cut

Right—Dipper Digging Sandstone
Shattered by L.O.X.

condition, it is mixed with the No. 9 coal by being fed directly onto a 42-in. belt which extends from the dump in the underground mine to the tippie. The railroad-car dumping point for this strip-pit coal is located directly above the portal of the slope leading to the underground mine.

Because of the hard nature of the overburden, dynamite was a considerable item in the mining cost of strip coal. Beginning in September, 1927, L.O.X.—carbon and liquid oxygen explosive—was substituted in the

place of dynamite for shooting the overburden at the strip operations. The result has been a reduction in shooting cost from 30c. to 15c. per ton. The latter figure includes all fixed charges on the liquid oxygen plant.

The explosive is made at the Western mine and is handled by motor truck to the other strip pits. The haul to Carbondale is 3 miles, to Sunlight 18 miles and to Nebo 32 miles. Dynamite is still used at the Morrison mine, at Centertown, because rough roads and a distance of 54 miles make it impractical to haul the L.O.X. to this operation.

The explosive is made by soaking cartridges of a porous form of carbon in liquid oxygen. When detonation takes place the carbon and oxygen combine instantaneously to form carbon dioxide. The soaked cartridge becomes cooled to the temperature of liquid oxygen, -180 deg. C., and is explosive only so long as it remains at this temperature. The soaking box in which explosive is transported by motor truck has a capacity of 55 cartridges, or 1,000 lb. Insulation of the box holds heat



Electric Shovel and CUT STRIP-MINE

By *A. M. Nielsen*

General Superintendent, Strip Operations
Norton Coal Mining Co.

Improved Shooting Costs



*Coal Loading Shovel
at Western Mine*

transfer down to a point that soaked cartridges can be kept for 24 hours.

Because absorption of heat causes evaporation of the oxygen there is a time limit between loading of a shot and the firing. This time is dependent to some extent upon porosity of the carbon used. We are now using carbon black, which allows an interval of only 15 to 30 minutes between loading and firing. It is the intention to change to the use of acetylene black, which makes a more effective explosive because of its ability to absorb a greater amount of oxygen and has the advantage of a longer interval. With either material a shot which might misfire usually becomes harmless less than two hours after loading.

The building shown in the accom-

panying photograph provides room for storing two carloads of carbon black, also houses a cartridge-filling machine, the liquid-oxygen manufacturing plant and two 200-cu.ft. motor-driven air compressors. A large floor space is allotted to storing oxygen flasks and for miscellaneous uses.

The liquid-oxygen plant alone occupies a floor space of only 60 ft. by 80 ft. Practically all of the equipment is of European manufacture. Installation was handled by the Keith Dunham Co. of Milwaukee.

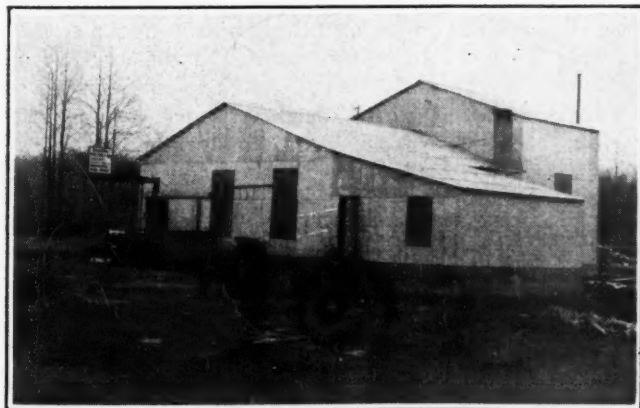
The process consists of compressing purified air to 3,000 lb. per square inch, then liquefying by passing it through an expansion engine and into an insulated column. The expansion causes the temperature to drop to

-194 deg. C., thus liquefying the air. A distillation process removes the nitrogen, leaving the liquid oxygen.

The maximum 24-hour capacity of the plant is 1,200 liters of liquid oxygen, which is equivalent to approximately 1,267 quarts, or 2,200 lb. When utilizing the liquid oxygen for preparing the explosive about one-third is lost by evaporation when cooling the cartridge. A total of 5 liters of oxygen is required to soak one 3½-lb. cartridge of lampblack. The maximum 24-hour output of liquid oxygen therefore will make 2,360 lb. of explosive.

We have had one shooting accident with the L.O.X. This occurred at Western mine, and seven men were concerned in the mishap. One man

*Houses Explosive Plant
and Two Mine Compressors*



*Showing All of the
Liquid Oxygen Machinery*





Putting Bags of Carbon Black Into Soaking Box

suffered permanent injury to his eyes, but the injuries to the other men were not serious. The accident was a premature ignition—not detonation—of about 700 lb. of the explosive distributed in four holes. Further explanation requires a description of the overburden at this mine.

As shown in one of the accompanying photographs, a $4\frac{1}{2}$ -ft. seam of No. 12 coal is stripped and wasted with the overburden. Because of the high flame temperature of L.O.X. this coal is at times set on fire by the shooting. Heat from fire in this overburden coal caused the accident.

Two holes 20 ft. apart and 60 ft. from the face had been loaded with L.O.X. cartridges, primed with

cordeau, and tamped. Two other holes 20 ft. distant and 40 ft. from the face had not been tamped. The L.O.X. cartridges had been charged into one and the motor truck had been moved to the next. Ignition occurred about as the last cartridge was dropped into the fourth hole.

The result was a burst of very hot flame out of the top of the hole as if from a gun barrel. The explosive in all four holes was ignited. The stemming was blown out of the two holes that had been tamped but the cordeau leading into these holes had not been detonated, indicating that the L.O.X. was ignited rather than detonated.

It is presumed that the two holes closest to the face ignited at about the same instant, but that ignition of the two holes farther back occurred after a perceptible delay during which time the heat from the other two holes traveled the 20-ft. distance, through the porous No. 12 coal. Six of the men were grouped around the two untamped holes and the seventh man was on a motor truck within a few feet of one of these holes.

It appears that the exact ignition temperature of L.O.X. is not known, but it is thought to be within the range of 350 to 400 deg. F. Ordinarily a temperature in the overburden coal approaching this range can be detected readily by odor of gases emitted from the hole.

Our experience indicates that L.O.X. is one-third more efficient in shattering effect than 60-per cent dynamite. The difference of results is evident where dynamite has been



Pouring Liquid Oxygen Over Bags of Carbon Black

used to shoot holes that are too hot for L.O.X. Photographs made at Western mine and here reproduced show the comparison. No large boulders are evident in the L.O.X. shot, and the sandstone into which the dipper is digging is well shattered. The dynamite shot left many boulders that were too large for the stripping shovel to handle.

Other advantages of L.O.X. are less wear and tear on the stripping shovels because the rock is well shattered and the resultant handling of greater yardage. The advent of L.O.X. and the present indications that strippers with 12- to 15-yd. dippers are coming point to increased activity in strip mining of coal.

An Approach to Complete Mechanization

(Continued from page 208)

sides of the block simultaneously. These cuts are rounded off slightly as a means of bringing all coal within convenient reaches of the loading machine. As the Coloder is a side-attack machine, it loads from a track laid in advance along the entire length of the slab cut. Since the Joy machine is of the frontal attack type, it loads end-on and the track is extended as necessity requires. While the bottom is fairly hard, the fronts of all machines are provided with rounded shoes or runners as a means of avoiding digging in.

For the three Joy machines the crew on the day shift consists of 32

men—2 cutters, 12 bug-dusters, 4 drillers, 6 track men, 4 timber men and 4 haulage men. Each Joy machine is manned by 7 men—1 machine runner, 1 helper, 2 track men, 2 haulage men and 1 shotfirer. One additional man follows each machine for the purpose of cleaning up after the loading machines. As the latter is paid on a tonnage rate he is not included as a member of the regular crew. The total number of men employed for the three machines is 55, or an average of approximately 18 men per machine.

The same number of men are attached to the operation of each

Coloder. For the two machines of this type on the day shift there are 20 men—2 cutters, 2 drillers, .8 bug-dusters, 2 timber men, 4 trackmen and 2 haulage men. On the night shift each loading machine crew is made up of 8 men—1 runner, 2 helpers, 2 haulage men (motorman and trip-rider), 2 trackmen and 1 shotfirer.

During the last five months prior to my visit the three Joys and the two Coloders loaded 93,476 tons in 122 working days, or an average of 255.4 tons per machine per day. The output per shift per man employed on these crews (day and night) during the period was $8\frac{3}{4}$ tons.

HERBERT HOOVER

... And the COAL Industry

"THE TEST of our whole economic and social system is its capacity to cure its own abuses. . . . American business needs a lifting purpose greater than the struggle of materialism. Nor can it lie in some evanescent, emotional, dramatic crusade. It lies in the higher pitch of economic life, in a finer regard for the rights of others, a stronger devotion to obligations of citizenship that will assure an improved leadership in every community and the nation; it lies in the organization of the forces of our economic life so that they may produce happier individual lives, more secure in employment and comfort, wider in the possibility of enjoyment of nature, larger in its opportunities of intellectual life.

"The government can best contribute through stimulation of, and co-operation with, voluntary forces in our national life, for we thus preserve the foundation upon which we have progressed so far—the initiative of our people. With vision and devotion these voluntary forces can accomplish more for America than any spread of the hand of government."

The foregoing quotations, taken from an address delivered by Herbert Hoover, Secretary of Commerce, before the Chamber of Commerce of the United States on May 7, 1924, contain a clear and convincing statement of the convictions and ideals behind Mr. Hoover's plans and actions in relation to our social and economic life; the whole argument and the conclusions reached are especially applicable to the coal industry, collectively and individually, particularly to the work of its associations.

THE interest that Herbert Hoover has taken, as an individual and as Secretary of Commerce, in the struggles and welfare of the coal industry is well known to many, but has not been, nor is it now, sufficiently appreciated or understood by the industry generally.

Especially has he been deeply interested in the elimination of the waste involved in present methods of coal distribution and marketing—economic waste—not that of individuals but the "waste that can only find remedy in collective action."

And it can be stated, with entire truth, readily proved, that every action or step which Mr. Hoover has taken with regard to the coal indus-



Herbert Hoover
Secretary of Commerce

try and its activities has had behind it the central ideas of self-held initiative, constructive leadership, co-operative organization for the good of all, elimination of economic waste, service—all with government stimulation and co-operation; not regulation, except "to prevent domination and unfair practices."

Take concrete and specific examples: In reorganizing the Bureau of Foreign and Domestic Commerce and creating commodity divisions, an entirely new feature, one of the first to be organized was that of Coal—a definite recognition of its importance in commerce and industry.

THE KEEN INTEREST taken by the Secretary in the coal industry thus made apparent, though well known in the Bureau, was em-

By F. R. Wadleigh

Former Federal Fuel Distributor

phasized by his efforts to assist the coal export trade. His intervention in Interstate Commerce Commission hearings and export and foreign coal freight rate matters is but one incident of many in the direction mentioned.

But it was during the miners' strike in 1922 that Mr. Hoover showed publicly and unmistakably his interest in and knowledge of the industry's activities and problems. With due and evident regard for the public, as always, he was mindful at the same time of the situation and rights of the industry.

No one who was not on the ground and in close touch with developments during that extremely trying time can have a true realization of Mr. Hoover's unceasing efforts and their results. His handling of the situation showed the breadth of his knowledge, his foresight and ability to organize effectively the conflicting elements in such a way as to avert a panic and save the country from the much more severe shortage of fuel that would otherwise have occurred, as well as to obviate an unreasonable and unnecessary rise in prices. And none of these results was brought about by coercion, but by consultation with those who were producing and selling coal, by fair treatment and just dealing, having in mind the best interests of the industry as well as of the public.

The emergency fuel distribution, hastily organized and put in operation under the President's Coal Committee, on which were representatives of the Department of Justice, the Interstate Commerce Commission and the Interior Department, was Mr. Hoover's own plan. The coal operators and distributors themselves were given a leading part in the distribution organization and every step taken was with their knowledge and

consent, as shown by the fact that there were nine representatives of the coal industry on the organization's staff.

AFTER the passage of legislation by Congress in September, 1922, authorizing the President to appoint a Federal Fuel Distributor for the period of a year the Secretary of Commerce continued to take an active interest in coal distribution and gave the Federal Fuel Distributor the benefit of his views and suggestions. Every step that he advised was entirely fair to the coal industry and for its ultimate best interests. The truth of the foregoing statements is known to me personally as one who was in close contact with the situation; it is quite time that the facts should be put before the coal industry generally.

It is timely and fitting also that the truth should be stated regarding the connection of Secretary Hoover with the Jacksonville wage conference of February, 1924; a matter regarding which many members of the industry, as well as others, have erroneous and misleading impressions, that I shall undertake to correct.

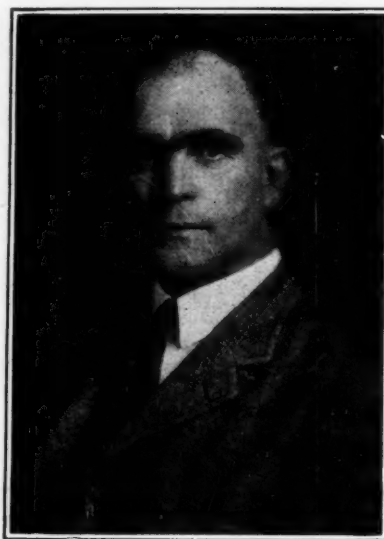
It was stated recently on the floor of Congress by a Senator and by a member of the House that the federal government was responsible for the Jacksonville agreement and its terms, inasmuch as both the Secretary of Labor and the Secretary of Commerce (Herbert Hoover) were present at the conference.

The truth is that Secretary Hoover was *not* present, nor did he have a representative at the Jacksonville conference. He was not in any way responsible for the terms of the agreement; his sole connection with the matter consisted in the advice given in a letter to a group of Pittsburgh (Pa.) district operators to the effect that they should attend the conference and "make every endeavor to set up a wage contract fair to both sides." The terms of the contract signed were agreed to by the parties themselves, without direction or pressure of any kind from the federal administration.

IN THE U. S. Bureau of Mines reorganization, since its transfer from the Interior Department to the Department of Commerce Secretary Hoover has retained as his adviser in coal economics and with regard to the industry's activities outside of purely technical questions a man whose entire business career was

spent in the coal industry; a fact that may be considered as another evidence of the Secretary's interest in the coal industry and that insures for him competent, intelligent advice and information regarding its operation and interests.

Let me repeat what I have stated many times elsewhere: That Herbert Hoover, as Secretary of Commerce and as an individual, has been and is a good and sincere friend of the coal industry. Although it irks him to see its quarrels, its jealousies, its abatable wastes in distribution and its



F. R. Wadleigh

labor difficulties, he has the welfare of the industry at heart and understands its problems far better than many of its members.

Secretary Hoover may have, as has been said, the "engineering mind"—whatever that may mean—but he certainly has the mind of the doer, the mind that will never be satisfied short of operating perfection in business; that abhors waste as a sin, yet can and does make allowances for ignorance, stupidity, carelessness and short-sightedness.

The coal industry may well look to him for disinterested and effective counsel and aid, whether as Secretary of Commerce or in a higher position.

Our Next Issue

The May number of "Coal Age" will be in the mail the first day of the month, or about a week earlier than usual.

Intake and Return Air Officially Defined

The vexed question of the terms "intake" and "return" air has been studied by the Mine Safety Board of the U. S. Bureau of Mines, which on Feb. 6 issued a decision "as a basis of teaching and policy" to be used as a recommendation of the bureau in reports either published or prepared confidentially for the use of mine operators. This decision, which is designated No. 8, reads:

(1) The term "intake air" and the term "return air" without qualifying adjectives shall be used only to define mechanical movement of the air respectively in an inward or outward direction with reference to the mine as a whole or to any one group of workings.

(2) When health and safety are concerned, the term "pure intake air" shall mean (a) air which has not passed through or by any active workings, and (or) (b) air which has not passed through or by any inactive workings unless these have been effectively sealed, and (c) air which is free from poisonous gas and by analysis contains not less than 20 per cent oxygen (dry basis) and not over 0.05 per cent of flammable gas.

As to unit quantity and quality of air, the Mine Safety Board issued on Feb. 13 a similar decision to be known as No. 9. It specifies that:

(1) The quantity in cubic feet of pure intake air flowing per minute in any ventilating split shall be at least equal to 100 times the number of men in that split.

(2) The quantity of air entering each unsealed place shall be at least 200 cu.ft. per minute and as much more as may be necessary to properly dilute and carry away flammable or harmful gases which may be present.

(3) The air shall be made to circulate continuously to the face in every unsealed place into which an appreciable quantity of methane enters.

(4) The air in any unsealed place shall be considered unfit for men if it shall be found to contain less than 19 per cent oxygen (dry basis), more than 1 per cent carbon dioxide, or a harmful quantity of poisonous gas.

(5) If the air, in any unsealed place, when unsealed or tested in any part of that place not nearer than 4 ft. from the face and 10 in. from the roof, shall be found to contain: (a) More than 1½ per cent of flammable gas, the place shall be considered in hazardous condition and to require improved ventilation, and (b) if more than 2½ per cent of flammable gas is found, the place shall be considered dangerous, and only men who have been officially designated to improve the ventilation and are properly protected shall remain in or enter said place.

(6) If the air in the split which ventilates any group of workings contains more than 1½ per cent of flammable gas, these workings shall be considered in a dangerous condition and only men who have been officially designated to improve the ventilation and are properly protected shall remain in or enter said workings.

Induction Motor and Exciter Added to Converter for

AUTOMATIC CONTROL

THE trend of electrical equipment installations in and around the mines is toward the fully automatic with the necessary safety devices so arranged that each piece of equipment will perform its duty in a thorough and safe manner without the necessity of an attendant.

At the No. 5 mine of the Wheeling & Lake Erie Coal Mining Co., Dillonvale, Ohio, a subsidiary of the M. A. Hanna Co., there was installed and placed in operation on June 29, 1927, a full-automatic 200-kw. 275-volt rotary-converter substation embodying new starting and operating principles.

The rotary-converter is a 275-volt 6-phase 60-cycle Ridgway type machine, operating at 1,200 r.p.m. Mounted on one of the bearing pedestals is the field frame of a 5-kw. 275-volt compound-wound generator, used for field excitation and for relay control. The armature for this exciter is mounted on and keyed to the rotary shaft. On the other bearing pedestal is mounted the stator frame of a 15-hp. 200-volt

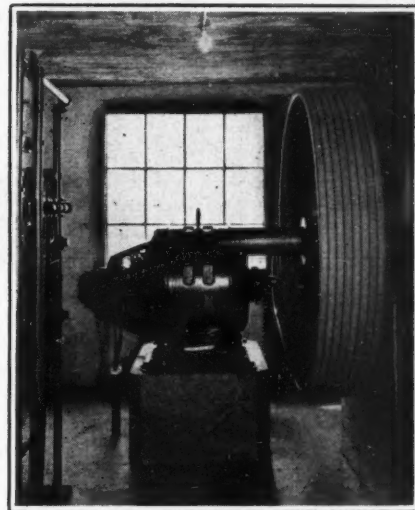
By R. C. Newman

*Chief Engineer
Wheeling & Lake Erie Coal Mining Co.*

3-phase squirrel-cage induction motor with the rotor mounted on and keyed to the rotary-converter shaft. The six leads from the three-phase windings are brought through the frame and each phase is connected, through a starting contactor, to the running taps of one of the rotary-converter transformers, in order that three phase may be taken from the transformer bank.

These three transformers are 2,300/200 volts with the primary side connected "Y" across the 4,000-volt incoming line. The 200-volt alternating-current control circuits to various relays, for starting and operating, are connected across the running taps of each rotary-converter transformer to provide dead phase protection.

If the alternating-current source of supply is correct and all bearing and transformer thermostat contacts are



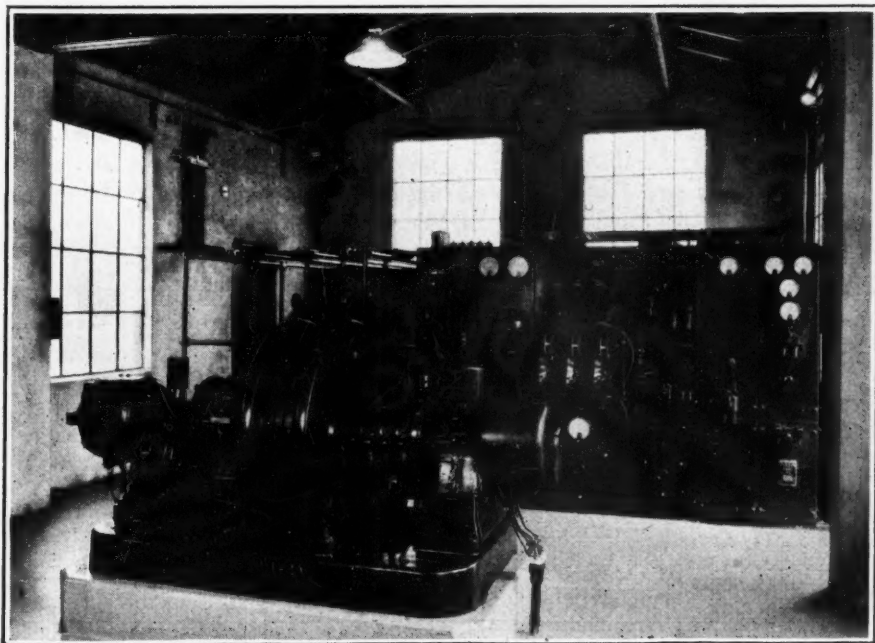
Motor Drive of the Fan

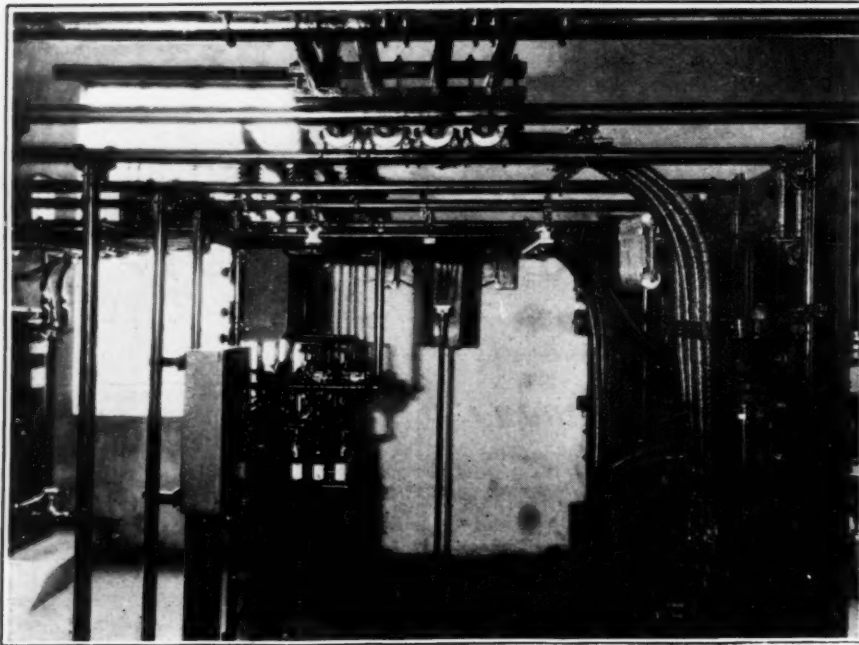
closed, the set will start by closing the starting snap switch. This operation closes the circuit through the heating coil of the thermostat relay in the motor circuit and the coil of the motor starting contactor, which starts the induction motor, driving the converter armature and exciter at the same speed.

If the converter field is opened by accident or because of exciter failure a relay will shut down the station and lock out all control equipment, or in case the exciter fails to build up when starting, the starting motor will operate only a definite time when it will be locked out by a thermal overload relay.

When the converter armature and exciter are brought up to induction motor speed and the exciter voltage has obtained normal value, a d.c. relay closes and its contacts energize the coil of a timing relay. When the timing relay is lifted, its operating coil is disconnected and the armature begins to drop slowly, being retarded by an air dashpot, and then makes contact, energizing the coil of the converter accelerating contactors, which closes and connects the converter collector rings to the 50-per cent taps on the transformers through a ballast resistance and accelerates the con-

In the New Substation at Dillonvale, Ohio





View Back of the Switchboard

verter from asynchronous to synchronous speed.

When the converter is running at synchronous speed on the 50-per cent transformer taps, its polarity is definitely fixed by the exciter but is operating with a weak field. The field is weakened by introducing resistance in the field circuit, which also aids in building up the exciter voltage promptly, but passes enough current to the field of the converter to fix its polarity.

As the timing relay continues to drop it opens the interlock contacts, which prevents the closure of the running contactor until the starting contactors are completely open, whereupon the running contactors immediately close. The starting and running contactors also are mechanically interlocked. The next and final operation of the timing relay is to complete the circuit through the field relay, which short-circuits the field resistance and provides full field excitation to the converter.

Closing the running contactors connects the converter collector rings to full secondary voltage. On this step the starting motor contactor is opened and a relay closes preparatory to the closure of the d.c. automatic reclosing circuit breaker. There are eight main operations in starting, handled by relays and contacts, operating in their proper sequence, and from the time the push button is operated until the d.c. circuit breaker closes, 40 seconds elapse.

This station is located approximately one mile from the tippie in an

isolated section and the 4,000-volt transmission line is controlled through a feeder panel located at the tippie substation. The incoming panel located in the automatic substation is equipped with a motor-operated circuit breaker and in case of voltage failure or the circuit being opened from the tippie substation, due to an approaching lightning storm or some other reason, all apparatus is disconnected from the line with the exception of the small circuit-breaker control transformer. When power is restored to the line the motor-operated circuit breaker will close and the rotary converter will again start.

In case of a momentary voltage failure on the incoming transmission line the set will start up in its proper sequence and if the exciter voltage has not dropped below normal the d.c. relays will operate, but from this point on the same time is taken to put the set on the line as if the set was starting from a standstill.

A 6-ft. clearance line has been

maintained between switchboard supports and around the rotary converter foundation. Future plans call for a duplicate set to be installed in this station and the rotary pit as well as the necessary conduit and switchboard supports were installed for use when the second set is needed.

As it will be necessary to operate the station only during the working day a time switch with Sunday or holiday cutout has been installed which will start and stop the set at a definite time each working day and stop Saturday night but not start again until Monday morning. A relay is installed so that during the winter months, as soon as the converter shuts down, the circuit will close, energizing bearing heaters, so as to keep the oil at its proper operating temperature during the shutdown.

Pipes have been laid below the floor line from the mine fan airshaft to the transformers located in the building and to the converter pits, in order to properly ventilate the equipment. Suitable valves were installed to regulate the air during the different seasons. Located in an offset room adjacent to the converter room there is installed a full automatic control to operate a 75-hp. 2,200-volt slipring induction motor driving a blowing reversible mine ventilating fan. The control board is equipped with a time switch for 50 per cent speed reduction during the night hours, when very few, if any, men are in the mine.

Steel sash, fitted with factory ribbed glass, was installed in all window openings except the lower panes, which are clear glass. This arrangement was made in order to appease the curiosity of uninvited persons and reduce the hazard of having them break the glass to see what it was all about. A time switch is installed to control space heaters to temper the air in the converter room when the converter is down, control the inside lighting and outside flood lights.

Showing the Clear Glass Panes at Bottom of Substation Windows



Why Restrict **LONGWALL** *To Thin Beds*

By William Tervit

*Formerly Longwall Foreman,
Pennsylvania Coal & Coke Corporation*

BECAUSE LONGWALL has been used but little in the thicker seams of Great Britain is no reason why its introduction here should be limited to thin coal. In that country there is a disposition to believe that only the unfortunate have need to economize in their methods of operation.

The operator with thick coal and favorable conditions need not consider, he thinks, the introduction of mechanical methods. Consequently, British operators do not benefit as they should from the advantages offered by the more easily extracted seams. This accounts in part for the lower output of coal per man in the mines of Great Britain.

In this country it is an accepted theory that the more easily the coal can be extracted the greater should be the output per man. Hence, the greater reason in thick seams for adopting mechanical appliances which will increase unit production. The thicker the seam the less the restriction in the application of machinery. No seams should be considered to be so easy of extraction as to require no machines, loaders and conveyors for their handling.

Despite all that has been said as to the tendency of those owning thick coal seams in Great Britain to rest satisfied with hand labor in loading, it must be confessed that British engineers have made greater advances in longwall than those of America. In fact, American operators have shown some hesitancy in attempting to introduce the longwall system. This caution has been due to lack of information as to the merits of longwall mining and failure to realize the

benefits to be derived from the system.

Some are disposed to believe that the reason why so many operators in Great Britain use longwall and so many in the United States, on the other hand, drive rooms and draw pillars is because Great Britain has lower coal and because longwall is suited to low workings whereas the United States has thicker coal, which is better suited to room-and-pillar methods. They hold that not only does longwall provide a place for the ripped rock in low coal workings but also that it is impossible of operation without the backfilling which ripping affords.

BUT IS THAT the real reason? Is it not rather that operation by room-and-pillar was the only method Great Britain knew in the early years of the coal industry in that country and that only the press of necessity caused the change to be made and that pressure was never as acute in the thicker seams?

I have already explained how loath the British operators were to break with their past in regard to direct loading by hand unless the thinness of the seam compelled them either to accept conveyors or shut down their mines. The same reason explains why the British have been conservative in introducing longwall in high coal and slow to learn that complete stowage of the extracted area was by no means obligatory.

The operators mining high coal in the United States have been somewhat similarly influenced. They, too, found that the room-and-pillar method could be applied to most seams more or less satisfactorily. They adopted it also in some cases because pillars had to be left to support the surface or in other instances because it happened to be the easiest to undertake.

In most cases, however, it has been put into practice because all other mines in the district were being run on that system and without thought that perhaps some other method would be better adapted to the coal, the surface and the prevailing underground conditions. Mining men have a tendency to persist in any method of mining which is well established in their district even though the circumstances which led up to the adoption of that method have changed and should no longer be factors in determining what systems should be chosen.

But surely there are some reasons other than finding place for the stowage of rock that makes longwall advantageous. There are inherent disadvantages in shortwall or room-and-pillar mining. Chief among these is the cost of transportation, which becomes a large item in the total cost of coal, due in a measure to the necessity, with rooms and pillars, of collecting coal from many widely distributed working places.

IN REPLY to this argument it will be said that with longwall mining a considerable expense for the support of the roof at the face and in the roadways is incurred and that it is unnecessary to face this cost if the coal is so thick that longwall is not necessary. In fact what will be gained by not having to gather from a multitude of scattered working places will be lost by having many timberman and rock rippers.

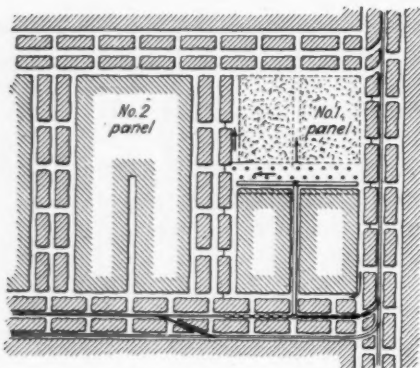
It will be said also that often with longwall less than half the men employed in the mine are actually digging and loading coal and the consequent charges for daymen constitute a large part of the mining cost. This is an unsatisfactory labor ratio unless the output per coal cutter or loader is much larger than usual. After all,



the same condition may be found in room-and-pillar mines. There it is ineffective haulage that is creating an unfavorable labor ratio, though there, on the other hand, the cutter and loader do not produce as large an output as in longwall workings. But all this objection, as far as it does not relate to the face, is removed where retreating longwall is practiced. There the roadways are in solid coal.

It must be conceded that by the aid of various types of heading machines which are now available the output per man in the room-and-pillar method at some mines has been substantially increased. The cutting capacity of these machines tends to reduce the number of rooms for a given output and thus lowers the cost of transportation.

By using the portable loaders now available to follow up the coal cutters into each room, the coal shot



Retreating Panel With Conveyors

down can be promptly hauled away, but room methods will ever be at a disadvantage because with them small quantities of coal always will have to be collected from a large number of rooms. This disadvantage, however, has been in some degree overcome by the use of machinery and by having a smaller number of places with a larger output per place per day.

The question whether to use longwall or room-and-pillar methods has been greatly clarified by improvement in technique, which has removed many of the drawbacks of longwall.

With advancing longwall and thick seams, deadwork often constituted a heavy expense. But these burdens in most cases have been greatly reduced, if not wholly eliminated, even without any change in the longwall method, by a study of the roof of the seam being mined and by keeping a straight face line with the timber and packs in accord with a system carefully ascertained to be that best suited to conditions.

INCREASED SPEED of advance also has been an important factor. Where the progress was only 12 to 15 in. per day, as it often was with men pushing cars, horse and mule haulage and coal undercut by hand, it was more expensive to keep the face open than when the advance is 6 ft. With such a daily advance the length of face required for a given output is reduced to a fourth or a fifth that which is necessary with the slower advance, and the area of roof disturbance at the face is reduced in the same proportion.

For this reason rapid progress aids roof control, and here it is that longwall gradually is fitting itself to thick seams. The loading is getting so rapid that even with thick coal the extraction can proceed so fast as to outstrip subsidence. It was just because extraction was slow that packwalls were so necessary. Where the coal was $3\frac{1}{2}$ or 4 ft. thick the face had to be built almost solid with packs if the roof was to be held.

Speed in extraction also restricts the area to be ventilated and reduces the risk of gob fires. Less supervision is required, and the ultimate result is lowered production cost.

In former days longwall retreating meant driving narrow places to the boundary at a tremendous cost before beginning to produce coal on a profitable basis. The preliminary narrow work needed in the past would have proved a severe drawback in the development of such longwall. Just at the same time as better methods are devised, making such driving to the boundary unnecessary, heading machines are introduced that make what little driving of entry is needed more rapid and less burdensome than before.

In fact a third factor enters the scene. Not only are distance and time reduced but at the same time the cost is so cut by mechanical means that the driving of narrow work can be made profitable, instead of a costly charge on production. With machines for use in narrow work, places can be advanced in coal at a speed of 120 or more feet per week.

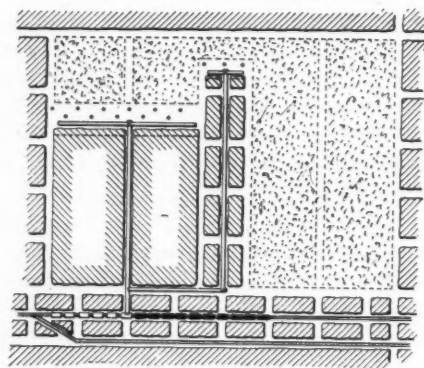
IN A THICK SEAM a good system is to form panels by the driving of headings and to extract the heart of these panels by retreating longwall, leaving around the extracted area, for future or almost immediate removal, pillars such as have been found adequate to protect them, having due regard to the depth of the cover.

Such a longwall area might be 750 ft. long and 375 ft. wide.

The entries by which such a panel would be developed could best be driven with the aid of some form of heading machine. Face conveyors could be arranged to deliver to a central gateway where another conveyor would carry the coal between solid pillars to the heading, at which point it would discharge its load into mine cars. The faces should be as short and as straight as possible.

The usual practice in bringing back panels on the longwall retreating system is to have two face conveyors carrying the coal along the working face to either end of the panel, where it is discharged into one of two gate-end conveyors and hauled along the sides of the panel to the heading. Here it is discharged into cars.

It also is the practice in this system to permit the center of the panel



When Second Panel Is Being Extracted

to hang back, but it is more economical to drive a room through the center of the panel lengthwise and place a centergate conveyor in this room and to have two face conveyors carrying the coal to the center of the panel and discharging into the centergate conveyor. The two ends of the panel should be kept well in line with each other.

This method of splitting the panel has many advantages, some of which are: (1) Only one gate conveyor is required in each panel. (2) Face conveyors are of the least possible length. (3) Less length of face has to be controlled. (4) Loaders have a shorter means of egress from the working face.

THE ENTRIES—or should they be called rooms?—driven to develop the longwall should be in threes, one in the center accommodating the main conveyor and two side ones which

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Can the SOFT-COAL Industry Be STABILIZED?

*A Review of Suggestions Made Before the
Senate Committee on Interstate Commerce*

By Sydney A. Hale

Managing Editor, Coal Age

CAN the bituminous coal industry be stabilized through federal legislation? Are there possibilities—as yet unexplored—for relief through co-operative action by the industry itself without government intervention or aid? Or must the law of economic jungle trample down the weaklings and the helpless that a firm rule based on the survival of the fittest finally may be established?

Overshadowed at the outset by the sheer weight of a story of industrial warfare where there is no Geneva code to soften the physical and economic brutalities of conflict, these underlying questions are now creeping into the foreground of the hearings which a committee of the Senate of the United States has been conducting for several weeks as part of its inquiry into conditions in the soft-coal fields of Pennsylvania, Ohio and West Virginia.

More and more, it seems, witnesses appearing before this Congressional group—the Senate committee on interstate commerce—are willing to agree with the suggestions of some of the Senators that federal legislative action is the only alternative to continued chaos. Many who have stood out for self-determination in the past now lend ear to proposals of complete federal supervision of the industry and join in submitting fragmentary or nearly complete programs for the consideration of Congress.

IN the tentative formulation of plans as developed in the interplay of committee discussion three concrete programs have come to the fore. Looking directly to the labor situation which inspired the present investigation certain Senators are asking whether legislation modeled along the lines of the Watson-Parker Railroad

Labor Board law would not meet the necessities of the bituminous coal industry in its industrial relations.

Taking another leaf from the book of federal regulation of the railroads, the suggestion has been made and several times urged that an interstate coal commission be created. This particular proposal, given the most definite expression in the testimony of John H. Jones, president, Bertha Consumers Co., would involve:

(1) The establishment of a federal coal commission, to be appointed by the President of the United States, with supervision over the coal industry similar to that exercised over the railroads by the Interstate Commerce Commission;

(2) Permission to the operators to consolidate or merge "wherever it is in the public interest to do so, without fear of litigation;"

(3) Permission to establish joint sales agencies under supervision of the proposed coal commission.

MR. JONES also suggested that the Senate committee call together representative heads of coal companies and representatives of the miners from Illinois, Indiana, the Virginias, Kentucky, Pennsylvania and Ohio "for a conference in order that a wage agreement may be worked out and a plan to prevent wasteful strikes, which have been so disastrous to all concerned." This suggestion led to one of the most dramatic incidents which have highlighted the drab routine of the hearings. Seizing upon the Jones proposal, John L. Lewis, international president of the United Mine Workers, asked permission to be heard and said:

"The mine workers would be willing to agree if the operators would agree and your committee would agree to call into Washington one

representative of the operators and one representative of the mine workers from every coal-producing district in America and put them to work here jointly in trying to work out some bill or some piece of legislation that might receive the commendation and affirmation of your committee to present to Congress to cure the evils which are now an eyesore in our country—some such method as was followed out by railroad labor and railroad managers in working out a modus operandi for settling the labor problems in the railroad industry."

"DO I understand you to mean that, if we had a commission appointed such as I suggested, the miners would be willing to submit any dispute to that commission and its decision would be final?" asked Mr. Jones.

"I am not prepared here today to surrender for the mine workers of America the inherent and inalienable rights to cease work to remedy their wrongs," answered Mr. Lewis. "But I am confident that some arrangement can be worked out under the application of proper experience and talent to the task that would eliminate the causes for strikes in the industry and reach the point that you so ardently desire along with ourselves."

"If we had this commission and both sides did not absolutely agree to abide by its decisions would that not be wasting a lot of time? John, we can not get anywhere unless we all agree to be bound."

The union program for legislative action, as offered by Mr. Lewis at the opening of the general hearings early in March, calls for:

(1) The correction of abuses which the union contends have grown up in the issuance of federal injunctions. Congress is asked either to repeal section 16 of the Clayton act allowing private interests to apply for injunctions against violations of the Sherman law or provide that no labor union, or its members, shall be enjoined under provisions of the act "unless it be shown that they are directly interfering with the transportation of goods."

(2) An amendment to the inter-

state commerce act to give the Interstate Commerce Commission control over railroad fuel orders. "It ought not to be difficult for the Interstate Commerce Commission," remarked Mr. Lewis, "when mandated by law, to prescribe rules that would restore to unionized mining fields the railroad fuel-tonnage requirements that have been arbitrarily taken away from them."

(3) Amendment to the Sherman law, if necessary, to permit mergers. "The bituminous industry," he said, is an impossible field for monopoly and, if anywhere the consolidation of industrial units is within the rule of reason, it is here." Nevertheless he feared there would be no substantial reorganizations or stabilization on the capital side of the industry without specific legislative indorsement of such ventures.

(4) Correction of alleged abuses of civil liberties in the non-union coal fields of the South.

ACCORDING to Mr. Lewis, the United Mine Workers has been the only stabilizing force at work in the bituminous industry. Equalized wage rates, he maintained, serve to stabilize production costs and minimize internal cutthroat competition. While placing the blame for the excess labor supply on the shoulders of the operators, he conceded that the excess might be eliminated. Just how was not clear. Some union officials who followed suggested further curtailment of hours.

From the union camp also comes the suggestion that complete unionization is an answer—but unionization accompanied by legislation. Soft coal, Van A. Bittner testified, cannot be put on a proper basis without the aid of some government agency. A commission is needed, but the right of collective bargaining must be preserved. The law should include a bill of rights protecting the United Mine Workers, outlawing "yellow-dog contracts" and giving union right of contact with the non-union worker. "I say to you frankly," added Mr. Bittner, "I would not want to see the entire industry of the United States organized under the jurisdiction of our union without some legislation to protect the public."

Common selling agencies are looked upon not unfavorably by W. G. Warden, chairman of the board, Pittsburgh Coal Co. Such agencies, along with consolidations were specifically named by S. H. Robbins, president, Ohio Coal Operators' Association, as

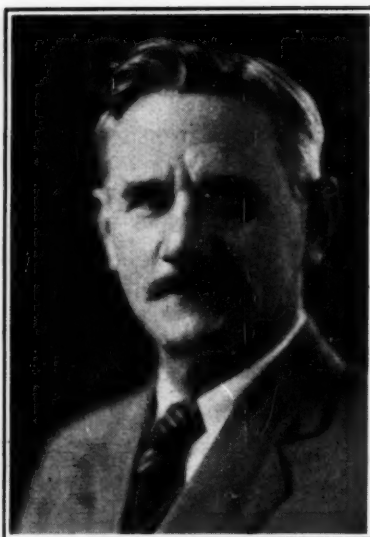


Photo by Blank-Stoller, Inc.

John H. Jones

possible aids to stabilization. On the other hand, J. W. Searles, president, Pennsylvania Coal & Coke Corporation, opposes common selling agencies and H. A. Glover, chairman of the marketing committee, National Coal Association, thinks co-operative marketing impracticable without consolidation of the physical properties supplying coal to the selling agency.

That mergers, however, are only palliatives and not the real answer to the problem is suggested by Charles M. Schwab, chairman of the board, Bethlehem Steel Co. He sees little chance apparently for stabilization through legislation. The fundamental problem, he insists, is one of human relationships to be worked out directly by employers and employees. Reallocation of excess labor to other industries would help, but this process, characterized as only a temporary expedient, must necessarily be difficult.

THE analogy between the coal situation and the railroad situation was set out several times. During a colloquy between Senator Gooding and Mr. Robbins the Senator from Idaho said:

"I remember very distinctly that railroad officials together with representatives of the brotherhoods and railroad labor generally came before the interstate commerce committee championing the Watson-Parker bill. I was very much impressed with the spirit of fairness shown on both sides in connection with that legislation. And it passed without opposition. It provided, as you know, for a board of conciliation and mediation and arbitration. And it is the general belief that that legislation has saved some very serious strikes since it was en-

acted into law although it has only been on the statute books for a short time."

"I think coal is just as vital to the country as the railroads. I am under the impression if you will go along that line you can have a commission with power to see that you get a fair price for coal—and that is the only way, I think, whereby a fair price can ever be had. This is an age of monopoly and I think this situation can only be remedied by some kind of government control."

"I think," responded Mr. Robbins, "that some commission that would guarantee a reasonable profit on the investment, that would enable the operators to fairly and properly operate their mines and enable the miners to have a fair wage scale, with the price of coal sufficiently controlled to admit of these things, might perhaps be helpful."

BUT such a stabilization, in the opinion of R. L. Wildermuth, general manager, Lorain Coal & Dock Co., might mean an increase of \$1 to \$1.50 in the price of coal to the consumer. Yet, he contended, production must be controlled and prices must be controlled—unless the survival of the fittest is to be the rule. Such control might mean monopoly, and "any kind of monopoly is dangerous unless you have some kind of regulation."

Some kind of enforced arbitration is necessary, in the opinion of W. R. Woodford, president, Rail & River Coal Co. It would be ideal, said E. D. Logsdon, president, Knox Consolidated Coal Co., if there were a commission to handle everything, including both union and non-union mines. W. C. Bower, manager of purchases and stores, New York Central Lines, also indorses the commission idea.

When a solution is found, thought some men who testified before the committee, that solution probably will be exhumed from the report of the United States Coal Commission. The final report of that federal agency recommended:

(1) That coal be recognized as an indispensable public service;

(2) That there be continuous fact-finding—compulsory where necessary—to cover costs, profits, wage rates, earnings and living conditions of the miners;

(3) Control of distribution in times of emergency by a coal division within the Interstate Commerce Commission;

(4) A check on further overdevelopment by Interstate Commerce Commission control over railroad service and rates;

(5) Federal licensing of interstate shipment of coal;

(6) Establishment of commercial ratings as a basis for car supply in times of transportation shortage;

(7) Amendment of law to give Secretary of Interior discretion in checking overexploitation of coal-bearing acreage in the public domain;

(8) Removal of existing legal barriers to consolidations.

The commission further recommended that the greatest possible

field for self-determination and self-regulation be left the industry.

THAT the members of the committee are convinced that a campaign of wage reductions is not the solution of the problems of the industry or a way to stabilization seemed evident in the persistence with which certain Senators asked witnesses from Ohio and Pennsylvania what would happen if further cuts were made in West Virginia.

"The position of some operators," remarked Senator Wheeler, "seems to be that they should cut wages in Pennsylvania to compete with West

Virginia and in West Virginia they should cut wages to compete with Pennsylvania. And that thing will constantly go on as it is."

"And never be anything but a temporary expedient," said John D. Rockefeller, Jr. But, he added, some legislation may be necessary to enable co-operation between operators and between operators and miners to eliminate this vicious circle. It was his idea that the answer should be sought step by step, attacking first the problem of overproduction, then the problems of distribution and finally the complex questions of labor relationships and wage rates.

Senate Committee Probes Soft-Coal Troubles

HOW FAR a committee of Congress may go in compelling business men to reveal the secrets of their business is the question now confronting the Senate committee on interstate commerce, which has been investigating conditions in the soft-coal fields of Pennsylvania, West Virginia and Ohio under the Johnson resolution adopted by the upper house several weeks ago.

The issue was directly raised on March 29 when counsel for southern West Virginia operators challenged the power of the committee to subpoena data showing the total tonnage, cost of production, labor costs, sales realizations, sales to individual railroads and prices received by individual operators from 1923 to 1927, both inclusive. Arguments on the question had not been completed on March 30, when the committee recessed until April 9.

Since the committee began its general hearings at Washington on March 7 two score witnesses have passed in review. Captains of industry, coal operators, labor leaders, clergymen, newspaper reporters and a lone railroad purchasing agent have taken the stand to tell what they knew or to meet charges made by the proponents of the investigation. Still more are to be heard and no one will venture an authoritative statement as to when the hearings may end.

Representatives of the United Mine Workers have described the sufferings flowing out of the industrial warfare in the three states and their presentation has been backed up by the testimony of newspaper men who have made special field investigations. Brutality has been

highlighted and the coal and iron police force of Pennsylvania scored. Unsanitary, immoral and lawless living conditions in the mining camps of the strikebreakers, poverty in the camps of the strikers have been painted with broad strokes.



John L. Lewis

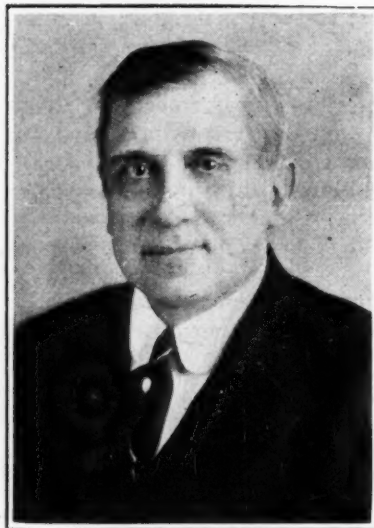
The activities of radical groups of Communistic sympathies or affiliations have been emphasized by union leaders, reporters and clergymen under the spur of examination by Senators Gooding (Idaho) and Wheeler (Montana), who retain a lively recollection of the havoc wrought in the West by the I.W.W. in the heyday of that organization. The United Mine Workers has been pictured as fighting almost single-handed against the radicals, and the coal operators who have broken with the union have been accused of encouraging the radical groups.

Injunctions, too, have been in the limelight. The character of some of the restraining orders issued—particularly those signed by United States District Judge Benson Hough in eastern Ohio and Judge J. N. Langham, Court of Common Pleas of Indiana County, Pennsylvania. The former was denounced by Senator Wheeler as unfit to sit on the federal bench. The judiciary of West Virginia also has been under attack, with Judge J. Grant Lazzelle, of Morgantown, the special target.

SPOKESMEN for the Bethlehem Mines Corporation, Consolidation Coal Co. and the Pittsburgh Coal Co. have refused to admit that the companies they represent broke the contracts made with the union in 1924. Senators questioning them, however, have indicated that they did not accept the explanations offered. Central Pennsylvania operators appearing before the committee have declared that they considered the agreements entered into following the Jacksonville settlement in the Central Competitive Field legally and morally binding upon both sides.

In the testimony so far presented the union has found little support for its charge that there is a gigantic conspiracy hatched by the railroads to crush the United Mine Workers. A few small operators from Ohio have testified that subordinate railroad purchasing agents told them their lines would not pay prices based on the Jacksonville scale. Larger operators, on the other hand, have denied that pressure has been brought to bear upon them by the railroads to break with the union.

On the contrary, Ohio, Pennsylvania and Indiana coal men who have appeared before the committee with records of their sales to the railroads generally have testified that the carriers have been paying somewhat higher prices than the run of industry. William C. Bower, manager of purchases and stores, New York Central Lines—the only railroad witness that has been heard—was emphatic in his denial that his road had attempted either to discriminate between union and non-union sources of supply or had been party to any understanding or agreement with the Baltimore & Ohio and Pennsylvania systems to manipulate coal prices.



Charles M. Schwab

JOHAN L. LEWIS, international president, United Mine Workers, the first witness heard (*Coal Age*, Vol. 33, p. 179), concluded his testimony on March 8 with a further discussion of conditions surrounding the making of the Jacksonville agreement, railroad fuel prices, the break with the Pittsburgh Coal Co., working conditions at the mines and the declaration that the union had never repudiated a national contract. He did, however, admit the prevalence of local strikes. "These local strikes arise from human equations in the localities in which they occur. The fault may sometimes be with the men and the fault may sometimes be with the local management."

The second witness was C. E. Leshner, executive vice-president, Pittsburgh Coal Co. He was examined on the organization of the company, its markets, earnings and labor policy. Mr. Leshner admitted that he was one of the many who had never read the Jacksonville agreement. He denied statements attributed to him in the *New York Daily News* to the effect that ethical considerations had been sacrificed for economic considerations in going open-shop. Labor costs in the Pittsburgh district mines of the company, he said, now were \$1.30@1.35 per ton, as compared with \$1.75@1.80 during the year ended April 1, 1924. Since the company had started open-shop there had been two reductions and one increase in wages.

The witness said that about 40 per cent of the workers brought in since the open-shop plan had been adopted were colored. The cost of coal and iron police protection in January, he said, was 4½c. per ton—about the same amount as had been deducted in union days under the check-off. As high as 308 of these policemen had been employed; at present about 100 are on the company payroll. He admitted the purchase of tear bombs, but denied knowledge of sawed-off shotguns as part of the police equipment.

There were 38 fatalities at the mines last year, he said. The accident rate has been greater since the company started open-shop.

"Did your organization," asked Chair-

man Watson (Indiana), "in any secret meeting, by any kind of understanding, whispered about, deliberately start out to destroy the union?"

"No, sir; they did not."

Frank E. Herriman, president, Clearfield Bituminous Coal Corporation, said that he regarded the agreement with the union "legally and morally binding." His company would have been glad to continue union relations if the labor organization had been willing to agree to a scale under which the mines could operate in competition with the non-union fields. The company is now paying a base rate of \$6, employing only white labor and producing "practically normal outputs." Labor costs constitute 74 per cent of the cost of production; under the last union contract the labor costs averaged \$1.63 per ton.

"Were you told by the New York Central Railroad Co. to cut wages?" asked Senator Wheeler.

"No, sir; I was not. It was because of the economic situation that prevailed in the district that we as operators in the district did it."

"I THINK it only fair to say," stated Mr. Herriman toward the close of his testimony, "that broadly we believe, and always have believed, in collective bargaining when we could deal with our own men and with the economic situation in our own district. What we have thought it wise to object to, and probably shall continue to object to, is what might be known as collective dictation, and that is what we have been up against ever since I was in the coal business."

William G. Warden, chairman of the board, Pittsburgh Coal Co., testified that the question of closing down all the mines of his organization came before the board in the spring of 1925. The decision to close was reached "because we were losing money." The losses in 1924 had approximated 10c. per ton on all coal mined; the net profit shown that year had come from other sources. In the two following years losses were greater because of smaller production and lower prices.

The company, said Mr. Warden, did

not try to evict miners but offered to move them without cost to camps where mines would not be reopened at an early date. This offer, however, was never accepted. He explained the boarding up of houses at Lick Run by saying that after the miners had been moved out the company discovered that it could not use the houses because the right of way to them was controlled by the union. "When we learned that we regretted exceedingly that the men had been taken away because we were perfectly satisfied they could have stayed in those houses so long as we could not put men who wanted to work in them."

A considerable portion of Mr. Warden's testimony revolved around the break with the union in 1925. Senators questioned him time and again in a vain effort to induce him to admit that the company had repudiated its agreement with the United Mine Workers. At one point in his examination Mr. Warden stated that he had been advised by counsel that the Jacksonville agreement was not binding on the company and that he had so informed his board.

In reply to questions from Senator Wheeler Mr. Warden declared that an open-shop policy was adopted because "we could operate our mines in an efficient manner, in the way that our operating forces wanted to do it and not be dictated to as to what we could or could not do or what position this man could or could not occupy. It was utterly impossible for us to pay the \$7.50 scale when our next-door neighbors in northern West Virginia, southwestern Virginia and parts of Pennsylvania were paying \$5." The witness flatly denied that he could operate more efficiently with union labor.

AT ANOTHER point in his testimony Mr. Warden declared that he did not believe in collective bargaining through organized labor. "I believe in dealing direct with the men."

"What you really believe in is a benevolent dictatorship?" asked Senator Wheeler.

"If it is efficient."

"You do not believe in the ideas of democracy at all?"

"Not so far as the labor situation is concerned in our own company."

Mr. Warden denied that the Mellon interests dominated the company; the board was the directing force, he insisted. He also denied that he had discussed his plan to go non-union with the Jones & Laughlin interests. He admitted that he had asked President Atterbury of the Pennsylvania R.R. to loan him Capt. John G. Searsh for the purpose of organizing the Pittsburgh coal and iron police force.

Rembrandt Peale, president, Peale, Peacock & Kerr, the last witness heard on March 9, voiced the opinion that the contract with the union had been morally and legally binding. He favored, he said, operations under union conditions if the competitive situation were so adjusted that such operations would be possible. If some system of regulation

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Engineers and Accountants Study Problems of ANTHRACITE INDUSTRY

COMBINING a visit to the Scranton Lace Co. with a dinner meeting at the Hotel Casey, in Scranton, Pa., engineers and accountants met March 23 under the auspices of the Lehigh Section, A.I.E.E., and the Engineers Society of Northeastern Pennsylvania to discuss common problems.

For the evening meeting 150 members and guests gathered about the banquet tables presided over by Herbert James of Scranton, Pa., as toastmaster. Addresses were made by J. F. W. Heinbokel, C. P. A., Scranton, Pa., and W. D. Canan, Rust Engineering Co., Pittsburgh, Pa.

Taking as his topic "Benefits Attained by Close Co-operation Between the Engineer and the Accountant," Mr. Heinbokel emphasized the necessity for engineers and accountants to work in close co-operation on any particular job in order that a complete story of operations may find its way to the books of the company. "The last twenty years," he said, "has witnessed great strides in engineering and almost a revolution in accounting methods, due largely to regulation by federal and state commissions and decisions growing out of the income tax laws.

"IN ALMOST all branches of taxation the engineer and the accountant must work together to attain the best results with respect to determination of property valuation, capital-stock values, allowable deductions under income taxation for depreciation, valuation of mineral reserves, and establishment of depletion.

"In all of this work the accountant has his field and so has the engineer. The engineer gets out into the thick of things, studies and prescribes the proper procedure and supervises the work. The accountant is required to devise methods of economically gathering data regarding what has been done. He is the unbiased recorder of the results of the engineer's work.

"I am confident that millions of dollars in taxes have been collected by the Internal Revenue Department, especially during the years when invested capital played such an impor-

tant part in the determination of the net income taxable, because such items as engineering, general expenses during construction, taxes during construction, and interest during construction were not recorded as part of the cost of a particular construction job. These items are just as much a part of the cost as the actual material and labor entering therein."

DISCUSSING the modern industrial plant, Mr. Canan said: "Due to recent developments it is now possible to use in the small industrial power plant much of the modern equipment and methods in use at the present time in the larger industrial stations for the economical production of electrical energy. Much advancement has been made in the past few years in the use of higher steam pressures and superheats.

"This change in initial steam conditions results directly in a decreased steam consumption of the generating units, together with a reduction in size of the boiler, the auxiliary equipment and the plant as a whole. High steam pressures also make it possible to extract or bleed steam at comparatively high pressures for process work or use in present low-pressure equipment. The trend toward higher pressures has been so marked in the last few years that it can be safely said that no one who is at present considering the installation of boiler equipment should fail to investigate the possibility of using steam pressures of 375 lb. or above.

"THE preheating of the air used for combustion, permitting higher stack temperatures and reducing the sensible heating loss in the flue gases, also has contributed to the increased ratings at which boilers are now run. Other factors which have contributed to obtaining higher ratings on boilers are the marked improvements which have been made in the design of the fuel-firing equipment, permitting in the case of stokers higher fuel-burning rates per square foot of projected area. This result is obtained by better agitation of the fuel bed, better distribution of air by

sectionalizing the wind box, overfeed at the end of the active grate surface and clinker grinders.

"Perhaps the most radical change in the method of burning fuel made in recent years has been the development of the pulverized-fuel equipment. Claims of the pulverized-fuel advocates, which to a great extent have been borne out by actual practice, are that this equipment makes possible the use of fuels of quite widely varying characteristics; that it enables the boiler to take care of sudden fluctuations and wide variations in loads, reduces the time necessary for taking off and putting boilers on the line and eliminates to a great extent standby and banking losses.

"Stage heating results in making it possible to feed water to the boilers at higher temperatures. Due to the fact that the steam used for heating must be at several different pressures additional power may be obtained in the expansion of the steam from the initial condition to the point of extraction. Another benefit resulting from stage heating is the reduction in the size of the condenser unit, which, of course, means less circulating water and also a higher overall efficiency for the heat cycle.

"BLEEDING steam at some point in its expansion from initial to final condition has opened up wide possibilities, especially in the industrial power plant. In the first place, bleeding makes possible pressures lower than that at which the steam is generated in the boiler without the use of a reducing valve, the turbine in effect acting as a reducing valve with, however, the difference that there is small loss in energy.

"By the use of bleeder or extraction types of turbines it is possible to install high-pressure boilers in plants where the auxiliary equipment is built for low-pressure steam, generate electrical energy and still have available low-pressure steam for operating the original low-pressure equipment.

"While not so important as the foregoing, the following may be mentioned as benefits which are directly chargeable to bleeding: (1) In the case of electrical generating equipment, the automatic balancing of varying electric and bled steam loads; (2) the generation of electrical energy as a byproduct, and (3) the rejection of less heat to a condenser with corresponding increase in the efficiency of the heat cycle."

LIGNITE FIELD

Of Saskatchewan

SPREADS TOWARD ESTEVAN

By John Galloway

*Managing Director
Sunlight Coal Co.*

TWO years ago the Crescent Colliery, having exhausted its coal supply near Bienfait, Saskatchewan, Canada, transferred its operations six miles nearer Estevan and last year the youngest mine in the field, the Sunlight Coal Co., started work on its property of 250 acres on the outskirts of the town. It is a strip mine and the first of its kind in the province, though 35 miles over the line in North Dakota there are two successful strip mines operated by the Truax-Traer Coal Co. under similar conditions.

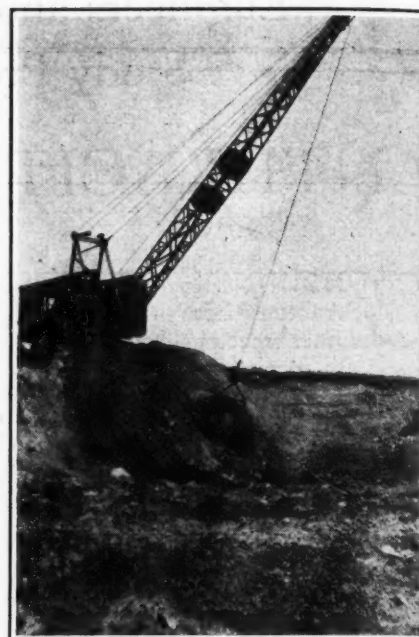
The Sunlight company started operations in September, 1927. The property was owned by local men and all the capital was raised in the town. It was an easy matter to prove up the property. A ravine runs through a corner of it, cutting off 40 acres and also cutting out the seam, so that the outcrop can be examined on each side of the ravine. A farmer had taken advantage of these circumstances to open up a small mine on the side of the ravine, in which it was easy to see exactly how the seam lay and to get samples for analysis.

South and east of this ravine the seam outcropped on the banks of the Souris River, so it was only necessary to check up the depth of over-

burden in the middle of the property. This was done with a horse drill, using a bucket of 24 in. diameter, and 120 acres was found to have an overburden of from 10 to 22 ft. The seam consists of 7½ ft. of top coal, 2 ft. of clay, then 3 ft. of bottom coal.

It is hoped to find a method of working by which the clay can be used in the brickyard, just off the coal lands, which is starting a pottery this summer. This clay is suitable for the making of tiles.

Stripping operations were started with a North West crawler powered by a 75-hp. gasoline engine, a convertible machine, which can be used either as a dragline excavator or power shovel. As a drag it handles a yard bucket at the end of a 45-ft. boom; as a shovel a 1¼-yd. bucket is operated by a 26-ft. boom. The machine worked as a drag from the beginning of September till frost put a stop to its activities in November, then the shovel boom was put on and the machine went down into the pit to load out coal. When members of the British Mining Congress paid a visit to the district, just after



Light Overburden

work had commenced, two men from South Africa were so interested that they could hardly be persuaded to leave to take in other features of the day's program.

Mine cars of two-ton capacity carry the coal to the tippie, where a small electric hoist raises the cars in a self-dumping cage to the shaker screens, which are operated electrically. Power is obtained from the town plant. An output of 800 tons per day can be obtained with the present plant.

Analyses prove the coal to be the equal of any in the field. Actual tests from large steam users prove it to be free-burning and free from the usual clinker troubles so common with lignite.

Why Restrict Longwall to Thin Beds

(Continued from page 218)

can be driven with the aid of small gathering conveyors which will serve both them and the crosscuts and discharge into the large one in the center room. This same large conveyor will serve for bringing back the room pillars, work on which will be delayed till after Panel No. 1 is entirely stripped of its coal and Panel No. 2 has made some headway.

Care will be taken to so time the delay in withdrawing the rooms as to furnish some protection to the longwall face against crushing without at the same time depriving it of such a

degree of stress as will aid in bringing down the coal. The longwall face in Panel No. 2 and the room pillar faces should not line with each other.

Where such a method is applicable to local conditions it should be adopted, for nearly every man in the mine will be actually mining coal, and deadwork will be almost entirely eliminated. The output per man aided by machines in room-and-pillar work in seams 6 or 8 in. thick has been considered high but is now not high enough to satisfy modern standards.

The room-and-pillar system is not adaptable to mechanical transportation of coal and is being abandoned in favor of panel systems with retreating longwall faces so that coal cutters, face conveyors and gate conveyors may be applied to the best advantage.

Most of the thick seams in this country are under light cover and are thus better adapted to longwall advancing or to paneling and retreating longwall than those in foreign countries. Both methods are worthy of serious consideration.

Why Mountain Valley Mine

RUNS EVERY DAY

By R. Dawson Hall

Engineering Editor, Coal Age

IN THESE times of fierce competition and a restricted market how is it that some mines can continue working while others are obliged to suspend operations? Why can they go on producing day by day where others work only one or two days a week?

This is a mystery that many in the industry would like to solve, and to get some light on the matter a trip was made to some of the mines that seem more than usually able, for some reason or other, to turn the trick. This article is about one of these successful mines. Investigation proves that it is not always the largest vessel in the coal line that weathers the storm best.

The mine visited was not by any means greatly favored except by the excellence of its coal, the soundness of the roof and the absence of gas. It was not a brand-new operation. In fact it was in some ways so unfortunate in that respect that about a week ago it was abandoned for a new mine which will attack the same coal from a more convenient point.

After many years of operation no sizable body of coal remained within $1\frac{1}{2}$ miles from the main opening. The grades were all adverse to operation. In fact the main haulage had two locomotives, each of 10 tons weight, to pull seven cars each holding only 2 to 2.3 tons, yet the armatures frequently burned out, so severe were the loads placed on them. There were gradients as heavy as 12 per cent against the load, and inclinations almost as steep were so general that the locomotive had no time to cool down.

THE coal was clean almost everywhere from top to bottom but was only 4 ft. thick and quite frequently only 44 in. Nor was there any large volume of tonnage over which to spread costs, for the mine produced only 400 or 500 tons daily.

Here, then, was a mine where the owners and management could succeed only by a diligent paring of costs. They did it by attacking the

major item of production expense, the charges for mining and loading. Now that they have this done they are going to reduce the excessive power costs and labor due to scattered and long-distance pumping, adverse grades and long haulages, which with them are not such relatively small charges as they are with others.

The mine to which reference is made, Mountain Valley No. 1, at Garrett, Pa., belonging to the Mountain Valley Coal Co., with headquarters in Baltimore, Md., is about five miles from Meyersdale on the Baltimore & Ohio R. R.

NO. 1 was opened by a long 20-per cent 600-ft. cross-measure slope which descended a vertical depth of 120 ft. and which passed through two coal seams before it landed on the C prime coal, many feet below the bed of the Castleman River. Doubtless this approach to the surface was the best that could be devised in the day of its installation, and it still is a generally accepted way of reaching a bed of coal not far enough below the surface to require a shaft. But it was, unfortunately, opened in an undesirable location on the flank of a deep synclinal, the bottom of which the mine has not yet reached.

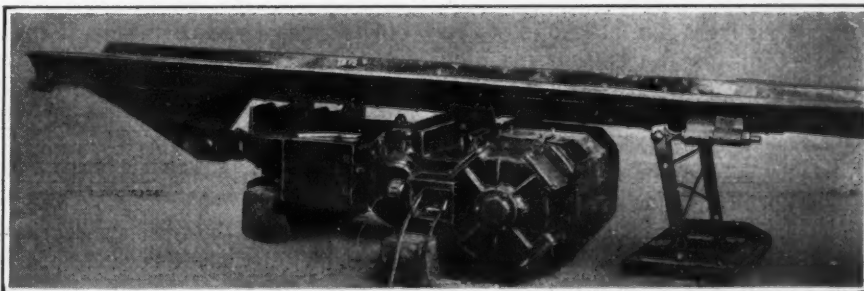
At the new mine also the coal will be brought from the seam to the sur-

face by a long cross-measure slope, but it will travel on a belt conveyor and, better yet, the belt will receive its coal at the bottom of the synclinal, and all the mineral, right and left of the slope driven within the coal seam, will be to the rise. The function of the locomotives will be to place the empties and to steady the loads on the way down to the main slope. No more will they have to haul loads up 12-per cent gradients, 4 per cent against the load being their recognized limitation. The cars will be dumped underground, one by one, in a continuous trip, swivels being provided between their drawbars.

One man will collect the checks, weigh the coal, enter the numbers of the miners and the weight of their coal on the sheet and then by pressing a button will discharge the contents of the cars into a hopper, after which mechanism will do the rest. The feeding of the cars to the dump will be by gravity. They will be turned over, brought back to their normal position and removed from the rotary dump automatically, the whole operation being initiated by a simple and speedy pressure on a push button. An output of 2,000 tons daily is proposed.

ONE man, therefore, will be foot slopeman and dumper for that entire tonnage. In this day to what narrow proportions have come that

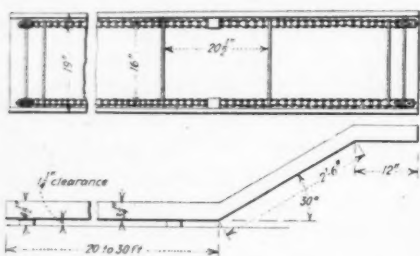
Meco Shaking Conveyor Delivery End and Drive



retinue of men who in times past broke the outgoing trips into small units and put the loaded cars on the slope, took them off, uncoupled and dumped them, assembled the empties and coupled them into small trips, let them down the slope, removed them at the foot of the incline, and finally made them up into larger trips!

One man alone will remain, and he will not have to hustle or to strain, but will do more effective work than the retinue of men he replaces. In addition he will, as already stated, take the checks and weigh the coal.

About ten years ago the management of this company undertook to test the possibility that con-



Gooseneck Conveyor

veying machinery would greatly reduce operating costs. Since then it has experimented with many kinds, including Eickhoffs, large and small; a Mavor & Coulson, a Mecos and several flight conveyors such as Tracy's Koalveyor and one designed by C. R. Claghorn, consulting engineer, of Baltimore, in co-operation with Patrick Carroll, the mine electrician.

THE statement of the superintendent, Charles Olsen, is that: "They [the conveyors] are all good if you give them the cars and speed up development so as to find place for them." To show how forehanded the company is, it already has had a Mecos in use for eighteen months though only just recently has this equipment been on sale in the United States.

The general practice has been to drive rooms 33 ft. wide, leaving 15-ft. pillars between them. The main conveyor is laid 5 ft. clear of the right rib. The rear of the face conveyor is set 5 ft. from the left rib, so as to leave room for the cutting machine to pass between the rib and the end of the face conveyor or whenever it is necessary to remove it from the gob to cut the coal at the face.

The face conveyor usually is of the flight chain type. That in use during the visit was of such light construction that it was not safe to let the

coal fall upon it. One designed by Mr. Claghorn and used extensively at the mine has at one end a gooseneck which compels the flight chain to climb a 30-deg. slope for a distance of 30 in., after which it travels 12 in. on a level.

THE slope raises the end of the conveyor 12 in. above the floor so that the cross conveyor is able to discharge its coal onto the main conveying unit. The rear end of the conveyor is level and lies with its upper edge $4\frac{1}{2}$ in. clear of the floor, the side bars by which the conveyor or chain is restrained being $1\frac{1}{4}$ in. above the coal bottom.

The lower part of the conveyor is so low that the coal can be caused to fall on the conveyor when it is shot. If it does not fall it is pulled over with picks. The operation of loading the conveyor is not merely easy, it is in part automatic. After all, the management is almost justified in calling the conveyors "loading machines," for they actually do in large degree load themselves or, more correctly, are loaded by the falling of the coal face and not by the hands and energy of the workmen.

The gooseneck conveyors vary in length from 20 to 30 ft. The overall width of the conveyor is 19 in. and the width over the chains is 16 in. The flights are placed at $20\frac{1}{2}$ -in. centers. The conveyor usually is set on loose steel rails; one man with a bar can move it forward on these without difficulty.

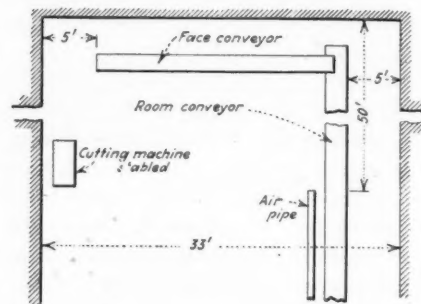
WITH one of these conveyors, a main conveyor of the shaker type and a mining machine 107 tons has been cut and loaded by four men in an 8-hour shift, three working at the face and one aiding in the discharge of coal into cars from the conveyor. Yet the coal was only 47 in. thick where this record was made. The output of the four men, however, will hardly average more than 85 to 90 tons per shift of 8-hours, largely because of delays.

The company has made every effort to eliminate these time losses, but they will not be wholly avoided till the area of the operations is more restricted and better gradients for the locomotives can be provided. Improved conditions will come with the substitution of 60-lb. rail for 40-lb., which now is standard at the mine.

Even though the men are working by the ton (the whole tonnage of any one room being split evenly by each

crew of four) the company is keenly alive to the importance of keeping the miners supplied with cars. The miners also are much interested, for there are few enough of them on one check that the industry of each man brings a distinct reward.

IF THERE were many room conveyors dumping onto a cross conveyor—suppose for instance there were four of the former, then there would be sixteen men on one check and any one man who would exhibit any excess of zeal, energy and intelligence in the conduct of his work would get back a sixteenth of the



How Mechanism Is Handled

increased tonnage resulting therefrom and the rest, in aggregate, would get fifteen-sixteenths. A man would need to be larger hearted than usual to strain himself to get so much for others while obtaining so small a return for his excess efforts.

Partly for this reason the room conveyors are not connected by cross conveyors. In fact, with the heavy grades obtaining, a single room readily furnishes a trip and that in a short time. Where larger trips are desirable and a cross, or heading, conveyor would be used to that end, payment could be made by the cubic foot extracted, so that each room crew would be paid according to the quantity of coal produced.

In each crew is a leader who has the privilege of selecting his own men. The company, realizing the importance of team work and of the loyalty of the men in the crew to each other, does not interpose its own judgment or wishes as to the personnel. All the men, however, share alike in the tonnage the crew loads.

To speed up operation a mining machine is supplied to each room which is stabled in the gob on the left side of the room just back of the face conveyor. The coal is shot by permissible powder.

In order to remove the smoke from the face promptly an auxiliary fan is provided in every conveyor

room with a Ventube air duct which is kept about 50 ft. back of the face, so as not to inconvenience the men by blowing the cold air directly on their backs.

These tubes have been used for two years and though they are laid on the floor and have somewhat hard usage they promise many more years of life. The tubes are hung up wherever the floor is wet. The main conveyor has a 13-ft. extension pan nested into the forward length of the conveyor. This pan can be moved forward a few feet at a time and bolted to the length in which it is nested.

Two men can easily handle such a pan even where 24 in. wide. No mechanical means are used, as with the duckbill, to lengthen the conveyor. Rollers, or wheels, are used under the pans, the company preferring them to ball bearings.

In the new mine the rooms will have 30-ft. pillars and an effort will be made to draw these as soon as each room is completed. The butt entry pairs will be driven full length and one room at a time will be worked at the end of one pair till the coal to the end of the entry has been removed. Let these two entries be known as *A* and *B*. There are at both ends of these shooflies, *C* and *D*, which pass from one heading to the other.

FOR the supply of cars to *E* and the rooms that succeed it empties are pulled through *C*, up to *D*, through *D* into entry *A*, where they are spotted for *E* or other rooms later driven in that entry. The loads will go out unobstructed through the entry *A* in which they were loaded.

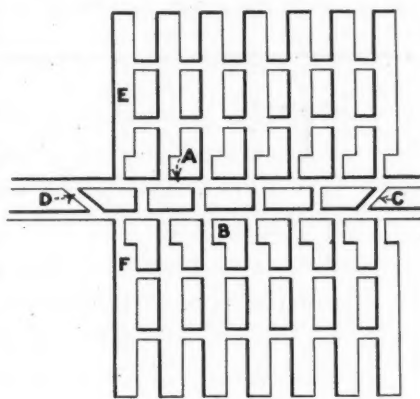
When later it becomes necessary to start rooms such as *F* in entry *B*, then the empties will be brought into entry *A* and pushed through *D* ready to be delivered to *F* in a trip. The loads will be pulled out by entry *B* as far as shoofly *C*.

The new mine is equipped with Marcus screens and picking tables for making prepared sizes and for cleaning the conveyor-loaded coal. Only occasionally is this care necessary. Usually the seam is so clean that picking is not needed. The coal, though it is of the highly desired low-volatile content, only about 19 per cent being volatile matter, is not as friable as most coal of this character. It breaks into large lumps, and thus is well fitted for sale in prepared sizes.

With the improved methods of dumping, belt-conveyor hoisting, screening and picking installed by

Roberts & Schaefer Co., and with the lessened power costs for haulage and pumping due to a better location and layout, this mine should be able even more surely and satisfactorily than ever before to continue operation regardless of market dullness and low prices.

THIS will be because it has learned that there is no profit in using brawn and muscle to lift coal into a car when power is available and that as much coal as will fall forward onto a conveyor can be automatically loaded, thus making human intervention needless.



Illustrating Gathering Methods

Much depends on being able to make development fast enough to accommodate machines capable of producing so large a daily tonnage. Especially is this the case when the coal is only 4 ft. thick and much hard bottom has to be lifted. Fortunately about 14 in. to 30 in. can be shot up without reaching the underlying limestone, which is so hard that a drill will hardly faze it.

Tracy Koalveyors of the larger type will not work in the rooms at Mountain Valley, for the height is too greatly restricted, but in driving entries they have proved quite successful. In eight double shifts in the coal and an equal number of shifts in rock—that is, in eight full days—250 ft. of entry was driven 12 ft. wide in 4 ft. of coal, lifting 14 in. of bottom and laying heavy (60-lb.) rail. This advance was attained in each of two parallel headings. Two men cut and shot the coal and fed it to the conveyor in each heading and one man attended to the cars from both headings at the points of car loading—five men in all. Thus the conveyor, which has made development so troublesome a problem, can be used to solve the very difficulty its introduction has presented.

LETTER

To the Editor

Attacks Coal Age Editorial

Independent expression of thought by the public press is desirable even when the views expressed are those of a small minority, but when a purely technical journal so far forgets its position as to express opinions concerning a political matter, as you have in the March issue of *Coal Age* with reference to the re-appointment of John J. Esch as a member of the Interstate Commerce Commission, it is time to consider whether we Southern coal producers can expect impartial consideration from a Northern publication supported in a large measure by Pennsylvania and Ohio advertisers and basking in that atmosphere.

We did not hear you squeal "politics" when the disgraceful attempt was made to pack the Interstate Commerce Commission with Cyrus Woods, an attorney of the Pittsburgh Coal Company, nor did we notice your indignation at the time Senator Cox was kicked off the Commission because of his views with reference to the Lake rate, nor did we hear you cry "unfair" when the Interstate Commerce Commission went out of its way to warn the Southern railroads not to reduce their rates—a veiled threat, without opportunity for review, against three great railroad systems with other important cases before that tribunal and dependent on its decision for its future existence.

Perhaps it is the policy of *Coal Age* to let its former editors have the freedom of its editorial columns, in which event the Pittsburgh Coal Company displayed excellent judgment in the employment of Mr. Leshner.

CHARLES C. DICKINSON.

Charleston, W. Va.

Mr. Dickinson evidently refers to an editorial, "Politics Cracks the Whip," which appeared in the March issue of *Coal Age*. Mr. Leshner neither wrote nor inspired this editorial nor did anyone outside the present editorial staff of this paper see it prior to publication. Editors whose opinions are influenced or whose pens are guided by the servility implied by Mr. Dickinson could not hope to discharge their responsibility either to their journals or to their industries.

Coal Age readers realize that this journal grew out of the strictly technical class years ago. Since January, 1924, the following statement has appeared on the masthead of every issue: "Devoted to the operating, technical and business problems of the coal-mining industry."

As far back as March 18, 1926, the danger to our governmental structure of mixing legislative and judicial functions was pointed out editorially in *Coal Age*. These editorials discuss principles of government rather than the merits of this case.—EDITOR.

Who Pays the Cost of

WITHIN the memory of this generation there has never been a time when business men were talking more about the ethics and the economics of price cutting. It is an engrossing subject of conversation among manufacturers right now. It concerns coal producers in the same way that the same conditions are involving other large buyers and sellers in numerous other industries. But the fact that these conditions are general does not make them any less particularly a problem which each industry must face in its own field and work out for itself.

We are, of course, in a buyers' market. There is excess capacity and overproduction in manufactured products and an intense competition for orders. But that is not all. We have had other periods when the buyer was in the saddle, riding the salesman whip and spur, just as we have had sellers' markets, when demand exceeded supply and the pressure was upon the purchaser; during the war, for instance. And whereas then the salesman was playing one buyer against another for a better price, the purchasing agent today is juggling one seller against another for a lower figure. It is not unnatural. The purchasing agent feels that it is now his time to be the wolf. It is his night to howl. But times have changed, and what was once considered a fair game of bartering has come to be a matter of the economics of an industry.

For there has been much progress in the thinking of American business. The pack peddler and the patent-medicine man have gone their way with their wooden nutmegs and fake nostrums. The days of barter in the village store have given place to a one-price policy in retail trade. Modern business ethics have purged the manufacturing field of many practices that once were looked upon as quite legitimate, but now are recognized as unfair either to the customer or the competitor. And now a new advance in the evolutionary process has introduced another idea—the responsibility of business men to protect the economic health of the industry in which they are engaged.

In other words, the growth of American industry has brought with it an extremely complex inter-relationship among manufacturers and between buyers and sellers throughout the land. Specialized

production has developed a tremendous volume of interindustry trade in materials, equipment and services. And also large concentrations of capital and industry have resulted in a degree of interdependence between the buyer and the seller in industry as has never been known before. And the present discussion of the prevalence of price cutting by manufacturers and profiteering by large purchasers has to deal with these new conditions.

precisely the philosophy that has dominated in those much-heralded cases where a large buyer has examined into a seller's costs and refused to accept cut prices that netted him a loss, knowing that either this seller must hereafter skimp on quality or service or ultimately go to the wall—unless the price level is restored.

In the electrical industry, for instance, where an expensive engineering type of equipment is involved,

THE purchasing agents of large buyers are being accused of profiteering. The complaining manufacturers are being charged with lack of price courage. What is it all about? In this article Mr. Whitehorne arrays the major factors in the situation. Unfortunately, this practice is not confined to manufacturers; coal producers are equally at fault. The editors will welcome a frank expression from our readers on this important and much-disputed issue.

Obviously it is poor business to be a party to a transaction in which either side is going to lose money. That is just common sense. For it usually costs more to win a new customer than the profit on the first order he gives. It is the continuing business from the account that pays. And it costs money also for a large buyer to take on a new supplier and establish an understanding of special needs and a dependable service. Usually it costs more than is gained by changing to another line just to seize a slight price advantage on the initial order—which is too often offered as a bait.

But there is more to it than that today. For so vast is the flow of goods and so greatly is the modern buyer sustained in his own business by his suppliers that a large industrial organization has come to be vitally concerned with the prosperity of the other organizations from which it draws. Put a manufacturer out of business by rendering it impossible for him to make money and you must look elsewhere for your next shipment of whatever it is you need. Let him live and he will continue to help you make more money. And that is

the buyer relies upon the manufacturer for another vital resource. He looks to the manufacturer to advance the art, to conduct expensive research, to carry forward the progress of engineering development. And if the manufacturer is denied profits that are adequate to finance the cost of it, then this will gradually cease and the industry must sacrifice one of its most priceless assets, unless the buyer assumes the burden.

Coming down to cases—just what is the situation in most industries? Two things are happening:

(1) Purchasing agents of large buyers are rigorously applying the thumbscrews to the manufacturers' salesmen and beating down price levels by ingenious methods of induced competition.

(2) Manufacturers in their eagerness for volume are weakly submitting to this pressure and cutting prices to get orders that net a loss and demoralize their market.

The first reaction is to just say, "Well, under the circumstances the purchasing agents are smart and the manufacturers are not. Why worry?" But when you look ahead and ask yourself what the consequences may well be within a highly interdependent community of business interests if this condition should continue very

PRICE CUTTING?

By Earl Whitehorne

Assistant Vice-President,
McGraw-Hill Publishing Company, Inc.

long, you realize that in the end the buyer would suffer with the seller, and the entire industry would be the loser by it all. Large-scale profiteering by purchasers, widespread price cutting by manufacturers in this day and age soon become a common problem.

What is to be done? It would seem that the burden of reform would rest upon the manufacturers, who possess the right to accept an order or decline it as they wish. But, as every manufacturer knows, the demand for volume is a remorseless pressure upon the sales department that must feed orders into the hungry hopper of a modern factory. And since the Sherman law forbids competing manufacturers to organize for mutual protection against the snares and pitfalls of a buyers' market, each one must take his chances in the open strife, and the price that can be charged depends upon the level of the market for competing lines. Let one sales manager weaken in the face of a persistent price squeezer and let a second fall in line and no other bidder can hope to hold to his figure and obtain the business.

Apparently there remains but one legal and practical defense to which the manufacturer may have recourse. That is the organizing of industry opinion to correct uneconomic practices and improve the standard of executive policy among both the buyers and the sellers. In other words, he must broaden the vision of the purchasing agent and stiffen the spinal structure of the sales manager.

The seat of the present trouble, it would appear, lies in the old tradition of the secrecy of bids, for here is the keenest weapon that the buyer is employing at the moment. A group of manufacturers are invited to submit bids on equipment to be purchased. The bids are in. The salesman call. The purchasing agent thereupon proceeds privately to play each man against the others, telling each that he is high, inciting each to telephone the factory, whipsawing them with fear and hope, until the last price cut has been exacted and

the last unhappy concession wrested from the profit margin on the goods.

Too often he who was the low man at the outset is the low man at the end, but minus profit. Too often, also, the order was all the time intended for him for some good consideration of the quality or service offered, in return for which he has been mulcted of his company's earning power on that sale. Because of the traditional sanctity of bids, he has been unable to demand a showdown when the bids are in, a chance to see whose price is really high—"which bird is early." For there are lying purchasing agents as well as lying salesmen and the temptation to play tricks with truth is sometimes great in buying.

Clearly, therefore, there are three things to be done as an approach to a remedy:

(1) Secrecy should be eliminated on bids for standard listed apparatus. Bids are published on government orders. Bids for private purchasers should be open to examination by any manufacturer who is called back and asked for a revision of his price. At present it is not supposed to be morally right to show a bid to a competitor. Where the bid entails a large element of engineering or other variables this secrecy undoubtedly will continue. But on standard listed apparatus—and this covers the major volume of the sales of industry—the buyer should show the bids when asking any bidder to reduce his price.

(2) The salesman should demand this frank showdown whenever called upon to cut a price after the bids are in. He should expect it as an evidence of good faith on the part of the buyer. Manufac-

turers should refuse to consider a concession without this evidence.

(3) The holding of post-mortems on competitive bids should be made standard practice among all electrical manufacturers, so that losers may analyze all bids and understand their lost business. This is lawful and already is being done to some extent, the exchange of bids being made by the bidders.

Of course, this would not end all cutting of prices. It would simply bring the practice out into the open and improve its morals. It would just be two steps toward an eventual one-price system.

But the seller should not be made to fight for this reform unaided. Purchasing agents individually and as nationally organized should also become the exponents of this idea. It is another step to be taken in the debunking of business, the banishing of deceit and trickery from trade. In this era of economic intelligence the gentle art of profiteering by purchasers should be laid away in shrouds along with the wooden nutmeg and that once popular commercial slogan, *caveat emptor!*

For men do not buy for price alone. Price is important. But other factors are equally important because they themselves constitute the value for which the price is paid. The chief concern of the buyer should be to see that he obtains a value proportionate with the price. The chief concern of the seller should be to see that he obtains a price commensurate with the value. And these two ideals are not antagonistic. They go together like the well known words *e pluribus unum*, to use more Latin.

Who pays the cost of price cutting, then? Both the buyer and the seller pay it. And in the end the entire industry suffers.

Three Recommendations

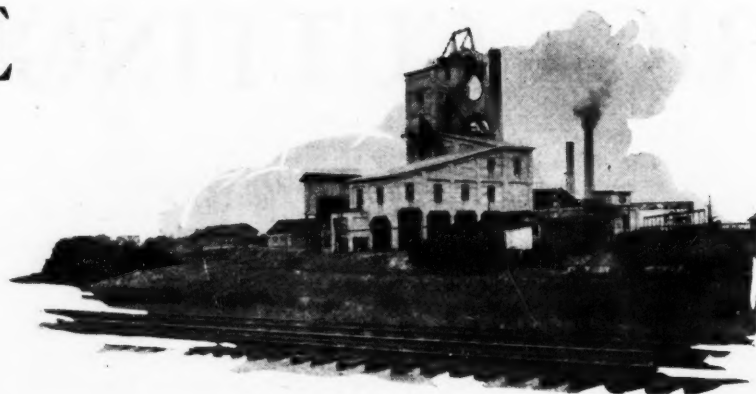
THAT BIDS on standard products be offered for examination by any bidder who is called back and asked for a reduction of his price.

THAT SALESMEN demand this as evidence of good faith on the part of the buyer whenever asked to cut a price after bids are in.

THAT POST MORTEMs on competitive bids be made standard practice among all manufacturers, so that losers may understand their lost business.

CONCRETE

In Tipple Construction



General View of O'Gara No. 12

By Frank H. Kneeland

*Safety Mining Co.,
Chicago*

FEW are the tipples built today into the construction of which concrete does not enter to some extent. As a rule, however, use of this material is confined to foundations only, the structure above this point being of wood or steel and glass. Within comparatively recent years concrete has been used so extensively as a building material that it is but natural that it should find its way into tipple construction.

The extent to which concrete is now used in building tipples is well exemplified in the accompanying illustrations. Thus the main or coal tipple at Kathleen mine employs concrete only for column footings and as a support and stiffener of the headframe, three sides of the shaft lining being carried up from the ground landing to approximately the dumping point. On the other hand the O'Gara No. 12 tipple, at Harrisburg, Ill., is a solid block of reinforced monolithic concrete.

Some mining men warmly advocate the concrete tipple; others condemn it. There is no question but that it possesses certain obvious advantages but it has potent disadvantages as well. Among the advantages claimed for it are: (1) Great permanence, (2) freedom from upkeep expense, (3) stability in case of disaster (in event of a mine explosion a concrete tipple will withstand a far more severe blast without injury than would one of steel or wood; similarly, wrecks and mishaps in the shaft never disalign a concrete tipple although they may do so in a steel structure). (4) Under certain conditions concrete may be cheaper than steel; it may also in some cases be erected more quickly.

Among its disadvantages should be mentioned: (1) It is difficult to alter or change a concrete tipple or to install new machinery within it to meet changing conditions. (2) The first cost in many instances is high. (3) Its mass is great compared to that of the machinery installed, and because of the structure's stiffness and weight

the wear and tear on the machinery may be excessive.

Nobody knows how long a concrete tipple will last but it is usually believed that its normal life will be at least 50 years. In equipping a property that has an estimated life of half a century or more, therefore, concrete as a tipple material should by all means be considered. Its permanence and total immunity from painting needs are greatly in its favor where a mine is to be served over a long period of time.

The concrete tipple, being much heavier than the steel structure of similar size, is far more stable under the influence of forces acting from either within or without. It is much more nearly vibrationless than is the steel or wood tipple. This is both an advantage and a disadvantage. It is advantageous in case of a mine explosion, a shaft wreck or a tornado. It is disadvantageous for some of the machinery installed. For experience has shown that the wear and tear on machinery in a non-vibrating tipple is greater than on that installed in one that will give and sway to some extent. In some concrete tipples wear has been heavy on the cage dump guides.

Under ordinary steel and cement market conditions there is little or no economy in the concrete tipple as compared to a steel structure of similar size and capacity; as a rule the concrete tipple is somewhat more expensive to install. On the other hand if structural steel is high priced and deliveries are behind, a concrete tipple may not only be built cheaper than one of steel but it may be completed and in operation by the time steel could be fabricated and shipped.

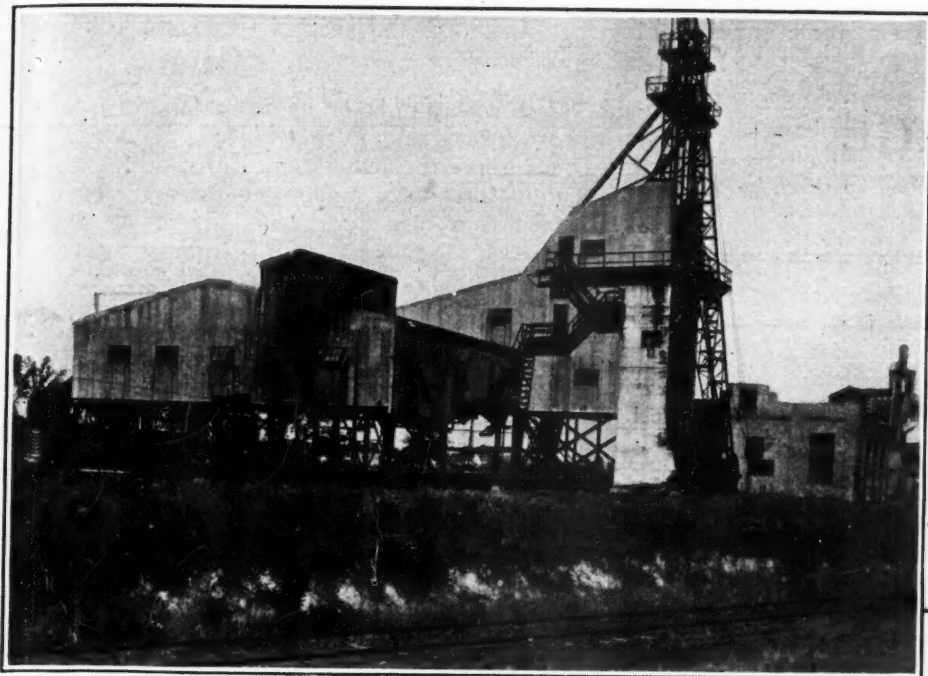
Probably the greatest objection raised to the concrete tipple is the fact that once erected it is difficult to

alter or change. New concrete does not readily bond to old so that while it is easy enough to tear out a part of a floor or wall it is not easy to rebuild the portion removed. The built-in section also is almost certain to "leave a scar." It is difficult if not impossible for anyone to accurately foresee the needs or trends of the industry half a century ahead and provide for the future preparation of the mine product that changing markets may demand.

Advocates of the concrete tipple, on the other hand, assert that it is no more difficult to alter such a structure than it is to change one built of steel of similar capacity and that any alteration to a steel structure also leaves its scar. They say that many steel tipples are planned for a life of 50 years and that the concrete structure has the same "expectancy."

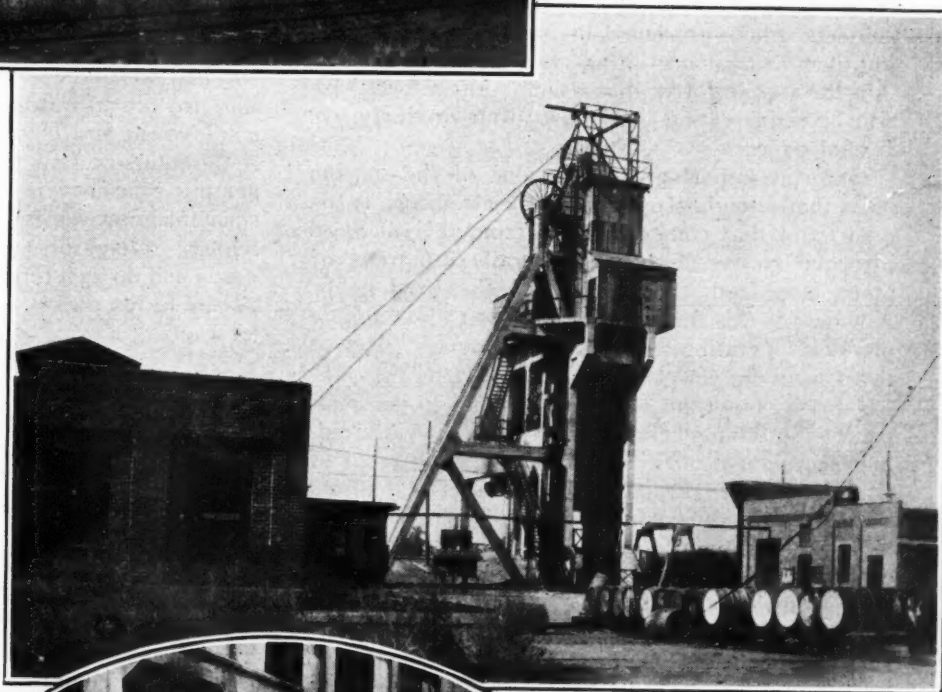
What are sometimes called side-hill tipples or those built to serve drift mines opened at approximately tipple height when constructed of concrete are as a rule considerably cheaper than those serving shaft mines. The same is true of tipples built to serve slopes. In both of these types the high headframe that forms a necessary adjunct to the shaft tipple is obviated and the weight is kept comparatively close to the ground.

Like many another problem that confronts the coal industry today, that of choosing between steel and concrete as a tipple material is one that is not susceptible of any general solution. The choice at any particular mine will depend almost entirely upon local conditions, upon the circumstances and considerations peculiar to the individual installation and on the material markets.

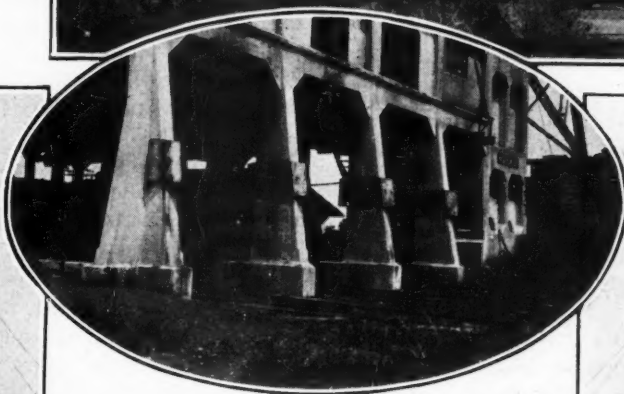
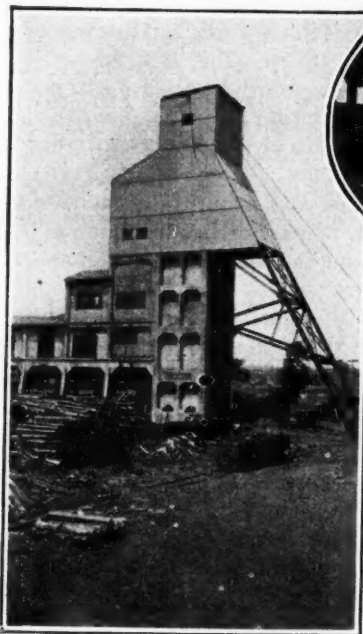


Main Tipple,
Kathleen Mine,
Dowell, Ill.

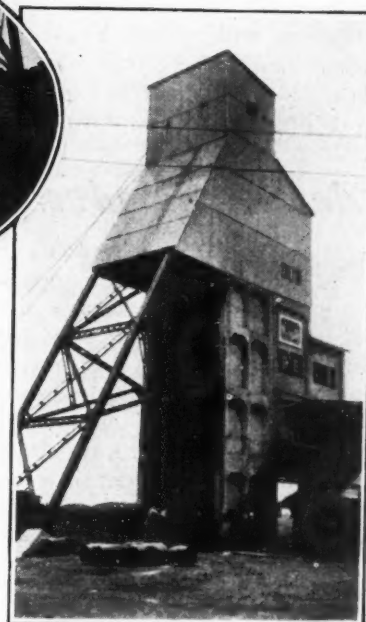
Auxiliary Tipple,
Kathleen Mine,
Dowell, Ill.



*Some
Examples of
Concrete
Tipple
Construction*



Tipple of Willis Coal Co.,
Sparta, Ill.



COAL AGE

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JOHN M. CARMODY, Editor

NEW YORK, APRIL, 1928

On to Cincinnati

ELSEWHERE in this issue of *Coal Age* appears a résumé of the program that has been prepared for the convention of practical coal operating men held under the auspices of the American Mining Congress at Cincinnati on May 7-11. A wide range of subjects will be presented by men who are sacrificing their own time to bring new ideas of operation into the arena of free discussion. Altogether there will be eight sessions and thirty-four or thirty-five formal papers.

Quite as important as the value of the specific ideas that attending operating officials absorb is the great gain that comes to them from several days' informal conversation with literally hundreds of other men from their own and other coal fields. Nowhere is this informal exchange of ideas among practical operating men more pronounced than at this Cincinnati convention.

Equally important to these men and to the companies that employ them is the exposition of coal-mine equipment. The Manufacturers' Division of the American Mining Congress has exhausted every effort to present the latest developments by more than a hundred manufacturers who serve the coal-mining industry.

Responsible executives who would have their practical operating men abreast of the best practice and the latest equipment can serve their own interests and those of their company by sending their men to the Cincinnati convention, and asking them to return with a written report indicating what they learned that admits of immediate and practical application to their own mines and their own production programs.

Anthracite advertises

NO CHARACTERISTIC of the American people expresses itself more clearly in business than that of individualism. The very genius of the race lies in that direction. Co-operative movements either among consumers or producers here rarely have been long-lived or effective during their short reign. Taught from early childhood that every boy is a potential President, it is not strange that individual ambition is fired and regimentation resented. And so it is with individual businesses or corpora-

tions. Each wishes to be on its own. Groups frequently are formed only to be dissolved.

This is apropos the announcement that operators representing forty-three million tons of anthracite have launched a plan for group advertising of anthracite coal. Details have not been made available, but it is to be hoped the problem has been thought through carefully and logically. Advertising undoubtedly is a great force in marketing. Without it American industry would never have achieved its present prestige. Danger lies in the fact that altogether too many campaigns end where they began—in splurge. Advertising campaigns must be fundamentally sound to be permanently effective. They must go beyond good copy. They must be backed up by performance. An individual can adjust his copy to his product or his product to his copy. He can organize to meet the ideals of his copy claims. With groups this is more difficult.

Friends of the industry, in the region and outside, will hail this and every other evidence of determination to extend markets and insure regularity of employment and income. Criticism will arise only if the industry fails to back up this campaign with genuine efficiency in operation at every point and constant improvement in quality and service to customers. Operators, miners and coal-carrying railroads will do well to remember the consumer. With money in his pocket to pay the bill, he wants what he wants at a price that seems to him to be fair.

Social engineering

IN SPITE of the lack of agreement as to the exact or even approximate number of unemployed—estimates vary from 1,800,000 to 4,000,000 and even more—a few facts stand out clearly. The existence of such a situation in an obviously prosperous period of national business throws into sharp relief a process that has been going on continuously for several years. Almost simultaneously scientific management and automatic machinery were introduced into industry. They made their way slowly at first. The rapid expansion of production during the war acted as an impetus to both. Throughout industry output per man per day increased. Two things softened the shock of this rapid development, one the tendency to shorten hours, the other the rapid and widespread increase in earnings of workers, which quickened their purchasing power. They had more money to spend and more time to do it.

Apparently the ability to produce, due to technological improvements and increased efficiency, has outstripped power to consume the goods as rapidly as they can be turned out through full-time employment of all the workers of the nation. Working with modern machinery and modern methods of management, through which much waste has been eliminated, 67 men are now able to produce as much in general industry as 100 men did a few years ago.

In the case of automobiles 33 men now do what 100 men formerly did. Many men so displaced have gone into luxury and service occupations created by prosperity. A considerable residue, amounting perhaps to two million, remains.

This constitutes more than a sociological problem; it is economic. Industry has learned that it prospers only when it has a full complement of consumers able to buy its products. Idle men do not make good customers. Improvements in industrial technique, however, must go on. Each individual enterprise and each industry must be encouraged to utilize every advance in technique, either in machines or in methods. The coal industry, for instance, in spite of the fact that it is faced by market restrictions through more effective utilization of fuel, must continue technical improvements looking toward lower production costs.

Under the circumstances is it well for the nation that the full burden of finding employment in already crowded fields be borne by men who are victims of technological progress? Is there not a more intelligent way to make constructive adjustment, remembering fully employed workers are consumers? Are hours to be shortened and available employment spread, or can research be turned in the direction of developing new industries—like radio, for instance? Is it not in the best interests of American business that an orderly plan be devised for anticipating industrial change, sponsored by such groups as the Chamber of Commerce of the United States, the American Federation of Labor, trade associations, the Department of Labor and the Department of Commerce?

Treatment of timber should be standard practice

ONE cannot but pity the mine manager who has to meet the problem of mine senescence, especially when the whole plant of which he has charge has been run in the past on the basis of doing the work only so well as to assure that the needs of the immediate day were met. Year by year the problems become more impossible of solution, the roads get longer and the burden of timbering the roadways grows.

In fact renewals must be more frequent than when the mine was young, for the air has more carbon dioxide and carries more fungous spores. Every renewal that is delayed results in a timber failure and fallen roof. Thus the replacement requires more timber and involves the removal of fallen rock, the cost of which is large but hardly definite enough to be included in calculations made to illustrate the losses of untreated timber.

The new publication by Tracy and Tolch on mine timber, which is reviewed in this issue, shows that of the expense of placing a set of untreated timber the cost of the wood itself delivered at the mine is

54 per cent, the labor of placing is 43 per cent and the rest of the cost, 3 per cent, is for framing. To use thoroughly treated timber, which increases the life of the material from 3 to 15 years, will raise the initial cost only 6 per cent. Yet there are few companies who are willing to expend that small percentage, though the interest on the money for one year would provide for the quintupling of the life of the timber.

The authors show that in one anthracite mine the saving per 100 ft. of gangway with sets on 2-ft. centers is \$182.50 per year. None having timber with such a short life as three years can defend the use of untreated timbers. Where intake air is passing and fungous spores are less prevalent timber will last longer, but if more than seven years' life is demanded under those favorable conditions it would be well to use preservatives unless masonry, concrete or steel are preferred.

Preservative treatment should be provided either at the mine or at the factory. In either case the timber must be framed before treatment, for the cutting of a treated timber may expose to fungus interior parts that have not been properly impregnated. With the standardizing of timber sets this will be easy to arrange. The day is surely coming when on all permanent work the use of shop-cut treated timber will be standard practice.

Politics and commissions

ELSEWHERE in this issue we publish a letter from an irate critic who takes *Coal Age* to task for its temerity in expressing an honest conviction on the performance of the Senate of the United States in the matter of the reappointment of John J. Esch as a member of the Interstate Commerce Commission. This critic, like so many others who have entered the political discussion growing out of the lake cargo embroglio, overlooks the fundamental question at issue.

It is not a question of Mr. Esch or any other member of the Commission; it is not a question of the merits of the claims of the Southern or the Northern districts. But it is a question of whether the field of government regulation is to be occupied by judicial and administrative bodies or by political factions. It is a question of whether we shall have the orderly processes of administrative regulation or the disorderly process of political log-rolling.

The aggrieved Southern operators were well within their rights when, as they subsequently did, they appealed to the courts for an injunction against the enforcement of the Commission's order. This action was one which nobody could justly criticize. But, we repeat, if the action of the Senate on the Esch case is to be a precedent, it would be better to abolish the Commission, save the taxpayers useless expense and openly proclaim the existing system a failure.

The BOSSES Talk it Over



Getting Out the Coal

"HELLO, Super; why all the gloom?" said Mac as he entered the office after the day's run.

"Oh, I had an all-afternoon session with the Old Man. He said that not only are our haulage costs high but there is enough slack in our whole system that if we could cut out delays and wrecks we could increase our output at least 30 per cent. Furthermore, he told me that we didn't know what took place during the day; that haulage with us was a 'hit or miss' proposition. He talked about time signals, dispatching and, yes, he even mentioned signals. What do you know about that, Mac?"

"Jim," said Mac, "only last week I was reading in *Coal Age* about automatic signals and also about dispatching. Why, do you know, the article stated that one man not only handled all the trips in the mine but knew where every trackman, wireman, repairman, timberman and boss was in addition to that. Each motorman called this dispatcher for orders, the same as I once saw in a railroad office."

"But, Mac," said Jim, "consider how much that would cost. We would have to put telephones at nearly every sidetrack, and then anyway you couldn't get the motormen to report—too much red tape."

"Cost and red tape my eye!" was Mac's comeback. "Why, I sent the cost of all the telephones to the shop this morning in those two wrecked locomotives; then, besides, how about my lost production—increased cost? Then, don't you think, too, the fact

that a man on one of our big motors with a heavy trip can call up a dispatcher who can tell him 'Go' or 'Stay there and meet No. 21' will give him a feeling of safety? Then when he does go he can highball it without feeling that any minute he's going to see a headlight show up in front of him and his heavy trip. Boy, if we had something like that we surely could railroad that coal out of here! Schedules are all right as long as everything is running smoothly, but we want something that works in emergencies."

"But, Mac," returned the Super, "how about the upkeep on all those delicate telephones?"

Just then Shorty spoke up. "Mister, you get those telephones and I'll guarantee you they'll work. The 'phones themselves are in ironclad cases. As long as the lines will stay up the telephones will work. We can easily take care of the lines. They will be a wonderful help to me. Why I'll know every hour in the day how every motor is working, instead of a motor losing a couple of hours while someone hunts me."

"Super," said Mac, "I think you have the drop on the Old Man. He brought the subject up; now go after him."

"I wonder where he gets those ideas," mused Jim; "he certainly has me on the jump. I need some help."

"That's easy," said Mac; "reading and visiting. I know—I was in a railroad office once."

"All right, Mac, you win. I'll go to bat with him for those 'phones."

Can a dispatcher handle the transportation system of a mine?

If so, what should be his authority and range of duties?

Will dispatching and telephones justify the investment by increased output?

Will it benefit the loader by giving him cars when he needs them?

What preliminary or organization work must be done before Jim, Mac and Shorty can install their dispatching system?

All mining men are urged to discuss these questions.

Letters accepted will be paid for.

Discussion Sharpens Foremen's Thinking

Sees Profit in Power Study Though Some May Miss Point

WHETHER you publish them or not, I would like to make a few remarks about power-factor control. While power factor is essentially tied up with mine costs, as the article by J. H. Edwards in the February issue of *Coal Age* so aptly shows, I am afraid that to the average mine boss, superintendent or electrician the Einstein theory is just about as comprehensible.

After mulling the subject over in my mind I can honestly say that there are very few superintendents that I know, still fewer mine bosses and precious few mine electricians who could give an intelligent thesis on what power factor is or the relation it bears to power costs. The article is timely and, no doubt, will put many to studying, but it is over the heads of most of the men for whom it was meant.

It will have the same effect in some places, I imagine, as an expert centrifugal-pump man had on a certain superintendent I know. In the installation of a centrifugal pump the expert laid particular stress on the suction pipe being laid in such a way as to be free from air pockets. He emphasized the point and hammered it home.

A few weeks later the mine boss took up the case of an exceedingly long 2-in. wooden pipe from a small pump discharging from inside the mine to the bottom. The pipe had become almost clogged with sediment, resulting in overloading the motor and bursting the pipe close to the pump. The line followed the contour of the gob—up and down. The mine boss wanted to put in a 3-in. line and use the 2-in., when cleaned out, for shorter lines.

The superintendent made a trip in the mine with the mine boss and, after observing the ups and downs of the line, told the mine boss that if he would get rid of the "air pockets" he would have no trouble.

I bring out this point just to show that bad power may be due in many cases to poor bonding, undersize feeders, overloaded generators, etc., but many persons will jump at the conclusion that correcting the power factor will be a panacea for most of the power troubles to which their particular plants are heirs.

The interest aroused in the subject ought to boost the sale of power-factor meters, graphic wattmeters, voltmeters, etc., as well as of books relating to power factor. If it does accomplish this much it will not have been in vain. But if you showed with a voltmeter a drop of 250 volts in a mile and a half of feeder to a general superintendent, but in trying to convince him needed more feeder, and then got "the razz" for your pains, it wouldn't be surprising if you were a bit skeptical, would it?

The part a mine boss can play in

saving power depends on what authority he has, his knowledge of the subject and his willingness to co-operate with the electrical department. Another important factor is whether the mine is union or otherwise. Where a mine is using around twenty machines, fifteen locomotives, fifteen pumps, an electric hoist and there is a demand meter on the line it follows that if the machines and pumps—where possible—are put on the night shift there will be considerable reduction in the demand charge. If the mine is non-union and the boss has the authority he can make a big saving in this way alone. The feeders for motors will not have to be as big as would be necessary for motors, machines, pumps, etc., operating on the same shift.

If the mine boss has paid close attention to his development, though he meets with stiff grades, hard cutting, etc., in

READERS, how would you like to

Talk Over Your Job

with a group of mine officials from other mines?

Here is your chance. The men who write these letters tell you how they handle their day-by-day operating problems.

Don't miss these discussions. Read them and write your own views.

parts of the mine he can mine his area and keep up his output at minimum power cost by giving the subject intelligent study—by avoiding peak loads (in many cases overloading locomotives where it is wholly unnecessary and in most cases absolutely silly); by making time studies of haulage and arranging trips so that he can make a maximum number of dumps in the shift without "shooting" his hoist and demand for 15 minutes and then laying idle for 15 minutes.

This will call for good tracks well greased, well-kept rolling stock and smooth co-operation between different departments, such as gathering, main haulage and caging. To get the best results along this line demands telephone dispatching from the different sections to the bottom.

THOMAS JAMES,
Superintendent, Mine No. 3
Knox Consolidated Coal Co.

Bicknell, Ind.

Describes Other Methods Of Power Factor Control

I HAVE READ with interest the article "Power Factor Control," by J. H. Edwards, in the February, 1928, number of *Coal Age*. There is no doubt that the scheme of connecting the exciter will do as stated. A voltage regulator connected in the exciter field circuit will answer the same purpose.

There is still another way for automatic control that I have used for a dozen or more years, which is as follows: We ordered a new 300-kw., 250-volt motor-generator set and specified that there be sufficient turns in the series winding of the generator to cause it to over-compound 10 per cent at full load, and that the field of the synchronous motor be wound for generator voltage.

The current then for exciting the motor field is taken from the generator. This gives 250 volts at no load, 275 at full load and 287½ at 50 per cent overload.

When the set is started the field of the motor is adjusted to unity power factor at no load, and as the load on the set increases on the generator this in turn strengthens the field of the motor and gives automatic regulation with the power factor ranging close to unity at all times. The range is from 98 per cent lag at no load (after the machine reaches running temperature) to 98 per cent lead at 50 per cent overload.

This rise in voltage as the load increases also compensates for a like amount of line drop on the feeders.

If a machine is being used that doesn't have this over-compounding effect, there is nearly always space available to add extra turns to the series winding to cause it, without reaching the magnetic saturation point.

There is one manufacturer that I know of who constructs a machine in such a way that additional turns cannot be added, but these machines are designed to over-compound.

Rimersburg, Pa. J. A. SHAW.

Opportunities to Save Power Face Foreman on All Sides

"UNCLE JOE" CANNON, the picturesque Congressman from Illinois and one-time Speaker of the House, was asked at one time what he thought of the United States, and he replied it was a "hell of a success." The mine boss can be what Uncle Joe said about the United States, but if he ever is to arrive he has to learn something about power costs—this applies whether he is in direct or indirect charge of electrical maintenance.

Some of the most common wastes in electrical power are:

A big high-power fan running 24 hours a day and failing to get ample ventilation around the working faces.

Who has not seen pump after pump in coal mines run for hours at a time and never lift a drop of water.

Where is there a man who has not observed the extreme difference in the amount of power consumed when trips are pushed compared with when they are pulled. The man who pays the power bills surely knows—to his sorrow—what it means to push a trip of cars over a dirty track.

Who has not seen the power go off many times on account of a great number of motors trying to start their trips on parallel.

These are the things that the hell-of-a-success mine boss knows how to handle.

Every one of the above-mentioned conditions plays an important part in the successful operation of an electrically equipped coal mine.

It is generally known that all mine trips cannot be pulled, but I believe every man will agree that there is not an ounce of good business in having trips pushed day after day against miles of dirty track.

The most successful coal companies believe they can't afford not to have road cleaners; the others believe they can't afford them. Let us begin tomorrow by getting the roads cleaned, then get after the other conditions as soon as possible.

Ask the man who ever tried to push a car over dirty track what he thinks of wasted energy.
GEORGE EDWARDS,
Welch, W. Va.

Foresees Bountiful Harvest

If Plan Is Carried Through

FOLLOWING are my answers to the questions propounded for the discussion of "Bringing Down the Coal":

(1) Where the proposed system is being used, how successful is it? With the right men in charge the opportunities for success are limitless. I have seen this proved in quite a number of instances.

(2) Will it increase the output per loader? Ultimately, yes, unquestionably; but not in the initial stage. The ordinary human being does not take kindly to any sweeping change in methods. A factor which must not be overlooked in this matter is the increased safety realized through close supervision of the job.

(3) How should the wage and tonnage rates be adjusted to meet this change in operation? The operator should not attempt to reduce the rates as a means of defraying the additional expense which would be incurred at the outset of this new plan. Those who have the courage and foresight to "follow through" with this system, which is no longer an experiment, will reap a bountiful harvest.

Cassidy, B. C.
Canada.

JOHN BENNETT.

Says Foreman Should Direct Upkeep as Well as Output

REFERRING to the article of J. W. Powell, of Welch, W. Va., in the March issue of *Coal Age*, I heartily agree with him that the interests of the electrician and foreman are mutual, but do not share his opinion that the electrician should not work under the direction of the foreman. We must depend upon the foreman for the largest possible tonnage at the lowest possible cost consistent with the proper upkeep of the mine, and by that I mean that nothing should be done in the way of increased production or lowering of cost at the sacrifice of the future of the mine.

The foreman is in charge of the mine. He cannot produce coal unless the equipment is at all times in proper shape. There are times when certain

"HOW can I start writing for *Coal Age*?" writes a mine foreman of long practical experience. "How can I get my ideas across to other mine foremen and superintendents?"

To this man and others whose ideas on practical operation are sound these pages offer an opportunity to express themselves.

These pages are widely read. Operators are watching them for ideas and for men who can think and plan.

From the city office to the working face ideas count. Your mind improves by exercising it.

Published letters are paid for.

ting only from 15 to 18 places. The electrician continually complained to the foreman that it was impossible for him to keep the first machine mentioned in repair, due, as he claimed, to improper operation, and he finally told the foreman in a very abrupt manner that unless this machine runner was discharged he himself would quit.

It is hardly necessary to state that the electrician quit. In this particular case, had the electrician been in authority, the best machine runner would have been discharged, and as really good machine men are not so easily found the chances are that production would have dropped to an appreciable degree until some other arrangements could have been made.

I am therefore of the opinion that an electrician should have no authority in hiring or discharging men but that this authority should be delegated only to the foreman. Furthermore, I fail to see where it is a subjection for an electrician to work under the direction of a foreman, any more than it would be for a foreman to work under the direction of an electrician. My observation is that foremen everywhere compare favorably with electricians so far as morality, intelligence and ability are concerned. The majority of them, however, do not possess the technical knowledge of electrical equipment that electricians do.

Happy, Ky.

HARRY C. HOWES.

Manager, Happy Coal Co.

Mac's Scheme Will Succeed

If the Men Do Their Part

WHERE the system for bringing down the coal suggested by Jim to the Old Gent or one similar to it has been adopted it has met with varying success, depending upon the adaptability of the men and the mine to it. The inherent nature of some coal is responsible for producing a large amount of slack in bringing it down, but in most cases, even where this is not so, more slack is produced than need be.

A complete system such as is proposed would do much to reduce the amount of slack, provided the men adapted themselves to it, each doing his part fairly, and there were no hold-ups through one section working too slowly. It is essential, of course, that each man know just what is expected of him through careful explanation of the system and its aims.

Adjustment of wage rates, so that none of the men will lose by the new arrangement, will be necessary if the plan is to be certain of a fair trial. Each man should receive the same pay as before for the same output of lump, any increase in lump to be paid for on a bonus system. As output by the new method will depend largely on co-ordination of effort in each section any bonus for increased output should be divided among the men in the section on a basis to be agreed upon.

It is unlikely that there would be any increase in cost, except perhaps at the

start, and even so this would be more than counterbalanced by the larger returns from lump and the reduced overhead owing to the smaller amount of slack to be handled. It would be reasonable to expect an increase of 5 to 20 per cent in the output of lump.
Brentford, England. W. E. WARNER.

The Miner of the Future

"ACCIDENTS will happen" is a common expression about coal mines. When an accident results in personal injury we call it "bad luck" or perhaps connect it with a bad dream, an encounter with a black cat, Friday the 13th or some other pet superstition. When a miner meets with an injury we call it personal carelessness, and let it go at that.

The boss of the future as well as the workman will know that accidents are caused, and that their causes are preventable. Each of them will make a distinction between accidents and injuries and will be so familiar with the laws of probability that he will know to what extent certain bad practices will increase his chances of being injured.

Every mine will have a certain well-defined working policy specifying how all work shall be done. The timbering will be systematic and uniform—every cap will be well balanced over the post; posts will be set plumb. All standing cars will be blocked in such a way that failure seldom will be heard of. Explosives will be handled and stored the same by everyone. In fact the procedure of work in each place will be such that one place will look so much like another that there will be slight difference as far as order and general environment are concerned.

The probability of an accident occurring in an orderly place is very small compared with one in disorder. The fewer accidents—that is, unexpected events—we have, the fewer injuries we will have; so to stop injuries we must stop accidents. The foreman who fails to have the working places and all other matters under his supervision kept

S-A-F-E-T-Y

S-ecurity of timbers; safety guards.
A-lertness of workers.
F-reedom from hazards.
E-ducational program stressing safety; efficient equipment.
T-raining in the fundamentals of mining procedure; thoughtfulness.
Y-outhful and inexperienced labor guided by the more experienced.
Hazard, Ky. C. M. GILMORE.

up to a recognized safe standard can never expect anything but a high accident record—and his production cost will go the same way.

Working day after day according to the best practices a man has an excellent chance of long life without injury. But the man who fails to obey the rules—whether boss or workman—by increasing his hazards has a slim chance of reaching his allotted three score and ten years and cannot hope to escape numerous injuries and untold misery.

Welch, W. Va. FRANK MILLER.

Trade Literature

Shaking Chutes. Vulcan Iron Works, Wilkes-Barre, Pa. Pp. 6, illustrating and describing the operation of this chute, which is mounted on rollers and has a modified reciprocating action which propels the coal forward.

Standard Replacement Parts for Mining Machinery. Penn Machine Co., Johnstown, Pa. Pp. 137; illustrated. Lists rail bonds, trolley materials, gears and pinions, mine locomotives, mine pumps, room hoists, etc. The book is indexed for ready reference.

Sangamo Meters. Sangamo Electric Co.,

Springfield, Ill. Supplement to Bulletin No. 67. Pp. 7; illustrated. Incorporates the outstanding changes and improvements in the type HC meter.

Permissible Storage Battery Locomotive. Atlas Car & Mfg. Co., Cleveland, Ohio. Bulletin No. 1232. Haulage costs and safety are factors covered in connection with this locomotive.

Air-Jacketed Motors. Wagner Electric Corporation, St. Louis, Mo. Bulletin 151. 8-pp. folder illustrating and describing the use of these motors where dust, acid and alkali fumes and moisture are present.

Silent Hoist Winch & Crane Co., Brooklyn, N. Y., has issued Bulletin No. 27, showing a variety of types of Silent Hoist capstans, winches and hoists, each available in a number of different sizes.

Polyphase Induction Motors. Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin 1118-E. Pp. 15; illustrated. Types "AR" and "ARY" motors, with either sleeve or tapered roller bearings, are described.

Mine Safety Appliances Co., Pittsburgh, Pa., recently issued a revised edition of Catalog No. 3, Everything for Mine and Industrial Safety. The 135 pages are well illustrated and show a number of new mining and industrial appliances including the Edison Electric Safety Cap Lamps, Models F and G. This company also has issued a 4-page folder illustrating and describing its Type 65 Rock-Dust Distributor.

Sterling Precision Transit, a product of Warren-Knight Co., Philadelphia, Pa., is illustrated and described in a 4-page folder.

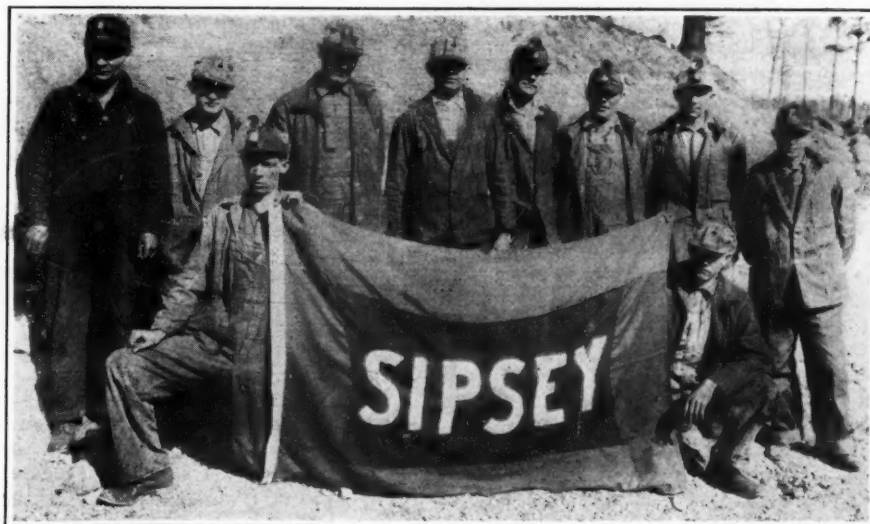
Lincoln Electric Co., Cleveland, Ohio, has issued catalog No. 200-B, of 26 pp., illustrating and describing its Linc-Weld Motors. This company also has issued Section 1611, 8 pp., illustrated, listing supplies for the Lincoln Stable-Arc Welder.

General Electric Co., Schenectady, N. Y., has issued the following bulletins: GEA-467A, CR7002 Automatic Starters for Slipring Motors. GEA-808A, Forms RA and RL, Totally Inclosed Fan-cooled Induction Motors. GEA-914, CR9441-LS424A Limit Switch, for Use on Control Circuits Only. GEA-137A, Synchronous Motors, Types TS and QS, for Mounting on Compressor Shafts. These bulletins are all illustrated.

Line-Start Induction Motors. Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin 1143. Four-page folder illustrating and describing the special features of these motors.

National Flue Cleaner Co., Inc., Groveville, N. J., has issued a leaflet illustrating and describing the National Soot Blower.

Officials at
Mine of
DeBardleben
Coal
Corporation
in Alabama
Employing
450 Men
Which Has Not
Had a Lost-Time
Accident in
Four Months



Standing, left to right: Jack Sullivan, washer foreman; Gene Moore, night foreman; C. W. Jones, superintendent; J. R. McGowen, assistant superintendent; D. G. Laird, mine foreman; Chas. Swindle, mine foreman; O. V. Simpson, safety inspector; Johnnie Walker, night foreman. Kneeling, left to right: Aaron Davidson, mine foreman; Roy Baxter, chief electrician.

NOTES

From Across the Sea

TO CRUSH coal fine and to separate in the process the extraneous ash from the pure particles and then to remove the impure material by washing—how simple it all seemed to the imagination in earlier days! It was soon found that specific-gravity separations were almost impossible with such fine material, for comminuted coal and comminuted slate floated away together in the first favoring current.

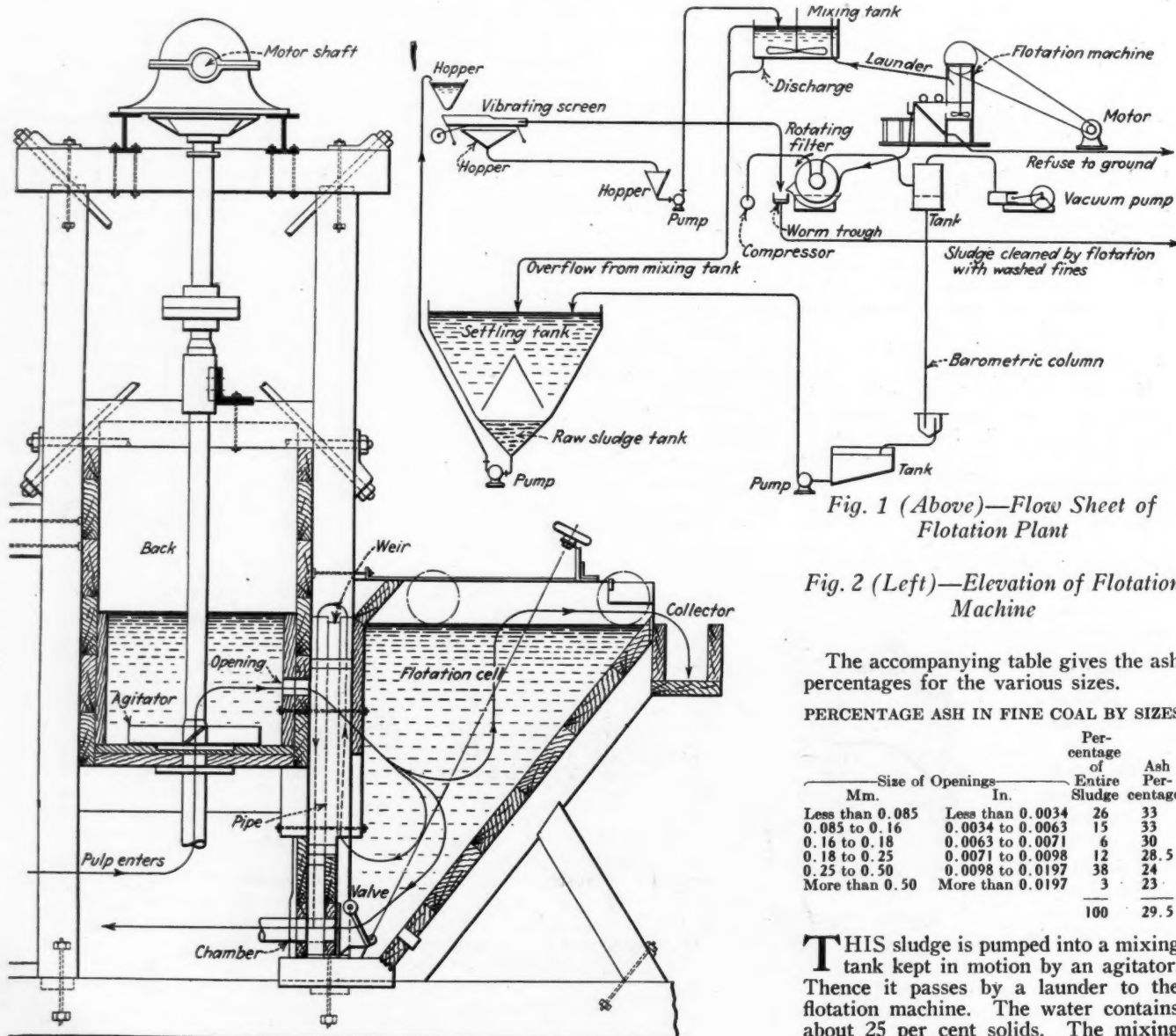
It chanced, however, that the metal-mine millmen found the same difficulty, till some one—either Mrs. Everson washing her husband's mine overalls, as some tried to prove in court, or some one else—discovered that oil froth and fine mineral substances were staunch

companions, whereas oil froth and earthy substances had no attraction for each other. The reader will recall how the Trent process makes use of this discrimination. There the oil is used in bulk. In the Minerals Separation and like processes it is used in extremely small percentages.

The grinding of coal to fine sizes is quite expensive, rather too costly for the operator seeking to clean his coal, but when the coal is already pulverized and must be cleaned or thrown away the problem is different. Settled out of the water and dried, it will fire, if bituminous, and be a nuisance. Allowed to escape into the streams, it is equally objectionable.

Apparently this reasoning has appealed to many European coal-operating concerns including the Société Générale des Minerais, at Brussels, which has been using the Minerals Separation process at the Beeringen collieries. Mons. Fréson, the engineer, describes the plant in brief in the *Annales des Mines de Belgique*, Tome XXVIII, 3rd Livraison, just received.

ALL the water coming from the coal washer is assembled in the hopper-shaped settling tanks illustrated in the left of Fig. 1, which is a flow sheet of the flotation plant. This is fitted with sliding gates which deliver into another tank from which the raw sludge is pumped into another hopper, making a regulated delivery to a vibrating screen which separates out all coal having a diameter less than 0.75 mm. or 0.03 in. This screen gives two products: (1) that which fails to go through the screen and is mixed with the fine washed coal between 0 and 10 mm., or 0.4 in. diameter; this product has about 10 per cent of ash, and (2) sludge which passes through the screen and is then treated by the flotation process.



The accompanying table gives the ash percentages for the various sizes.

PERCENTAGE ASH IN FINE COAL BY SIZES

Size of Openings		Per-centage of Entire Sludge	Ash Per-centage
Mm.	In.		
Less than 0.085	Less than 0.0034	26	33
0.085 to 0.16	0.0034 to 0.0063	15	33
0.16 to 0.18	0.0063 to 0.0071	6	30
0.18 to 0.25	0.0071 to 0.0098	12	28.5
0.25 to 0.50	0.0098 to 0.0197	38	24
More than 0.50	More than 0.0197	3	23
		100	29.5

THIS sludge is pumped into a mixing tank kept in motion by an agitator. Thence it passes by a launder to the flotation machine. The water contains about 25 per cent solids. The mixing

tank is provided with an overflow, and a discharge valve permits the return of the water to a settling basin in case of stoppage.

The flotation machine has ten identical elements placed in series. Fig. 2 represents a cross-section of one of these. Each element has an agitating back where the pulp, as it is termed, enters. Here is added by a regulated dropper to each separate element the small quantity of oil best suited to the operation, the oil used being in this case cresol.

The pulp escapes by an orifice into the flotation cell, where it divides itself into four currents: (1) an ascending current containing clean coal which floats on the surface of the froth, where it is pushed by two small revolving scrapers toward the collector; (2) a descending current heavy with slate which passes through an adjustable valve into the chamber beneath the agitating back, and (3) two lateral currents heavy with middlings which rise in a pipe and pass over a weir and down a transfer pipe into the next agitating back, where they are united with the water from the chamber under the first agitating back. The water leaving the

last element is discharged onto the ground.

The floated sludge contains 60 per cent of water. It has been the practice heretofore to run this coal into the overflow towers in which coal of 0.4 in. diameter and under is contained. This transformed the coal into a thick mud.

To remedy this condition the coal from the flotation machine is now treated on a rotating filter similar to the Oliver type, so well known in the United States. For its operation the compressor, vacuum pump, tank and barometric column are provided.

The ash percentage of the sludge is dependent on the nature of the flotation agent and can be decreased by adding a small quantity of gasoline to the cresol. The sludge treated contains about 30 per cent of ash. On flotation 65 per cent of the coal can be separated with an ash content of 8.5 per cent; the remaining refuse contains 65 to 70 per cent of ash. Thus about 85 per cent of the carbon contained in the sludge is recovered.

R. Dawson Hale

On the ENGINEER'S BOOK SHELF

Methods and Costs of Treating Mine Timber: What to Treat and What Life to Expect; 312 pp., octavo; by L. D. Tracy and N. A. Tolch; Carnegie Institute of Technology.

This book is the result of one of the mining and metallurgical investigations conducted under the auspices of the Carnegie Institute of Technology, the U. S. Bureau of Mines, and the Mining and Metallurgy Advisory Boards. It is designated Bulletin No. 33.

It brings together what is known about timber conservation by preservatives. The authors, however, have had to gather where they might. An investigation, to be conclusive, should run over many years. The various types of preservatives—coal tar, water-gas, tar creosote, wood-tar creosote, low-temperature tar and creosote, crude or semi-refined petroleum, zinc chloride, sodium fluoride, mercuric chloride, copper sulphate, arsenic, proprietary coal-tar distillates, Ac-zol, Wolman salts, Basilit and what not—should all be used on timber of various kinds under varying conditions with divers methods of application: painting, dipping, soaking, hot-and-cold bath, full-cell and empty-cell.

The development of decay should be traced in each of these instances and then it would be possible to find the best preservative to use for each condition. The corrosion tests were conducted much

in this manner. But investigators of timber preservatives cannot make such investigations in a single year except by creating an extremely artificial atmosphere to aid bacterial decay.

Tracy and Tolch have prepared a valuable manual of the material available, but the subject deserves a bigger and longer study financed by more ample funds. The authors should be asked to make it. They have assembled some extremely valuable information and experience including a good glossary. If the reader does not find what he desires he may well despair of getting more anywhere else. Interesting foreign information is given.

* * *

Frontiers of Science Series

A new series of books to be known as the "Frontiers of Science Series" will be prepared for the McGraw-Hill Book Co. by Edwin E. Slosson, director, Science Service, Inc. Perhaps an idea of its purpose can best be taken from Mr. Slosson's words: "There is plenty of highly concentrated technical literature and plenty of predigested popularization, but precious little about the progress of science for the fairly well-educated reader who wants to know something about what is going on outside his own pigeon-hole."

The language of these books, Mr.

Slosson declares, will be as simple and free from special technical terms as is possible with accurate and adequate explanation, but there will be no necessity to wade through bushels of ABC's to find a little fit to engage an adult mind.

* * *

Keystone Coal Buyers' Catalog. 1010 pp., quarto. McGraw-Hill Catalog & Directory Co., Ltd., New York City.

If one were asked for a book that would provide the information that coal buyers, wholesalers and retailers need on their purchasing problems, the Keystone Coal Buyers' Catalog would provide a satisfactory answer.

Its record of the various coal fields and of the mines producing coal from various seams, its analysis and fusing temperature tables are complete as ever. As before, the mines are listed alphabetically by states. Maps are given showing the locations of the various coal fields and something about the geology. The character of coal suited to various uses is given in generous detail and where such coal may be obtained. One is amazed, for instance, to note how widespread is the production of cannel. Trade names and companies by districts also are listed, as well as all the companies in the United States with the states in which they operate. Thus by turning to the appropriate place further data may be obtained.

So well known is this publication that the principal duty of the reviewer must be to call attention to the changes in its scope as it has adapted itself to the needs of the user. Its purpose is to give definite reader classes—the coal consumer, the wholesaler and the retailer—the information they desire. This has been carefully kept in mind. The consumer point of contact is with the company, the president and the sales agency. He wants information regarding the post office, the shipping point, the name and size of seam, the kind of opening, the daily capacity and the preparation equipment. These are the facts he receives in the alphabetical directory. He is not interested in mere operating details, so these no longer appear.

* * *

"Modern Blasting in Quarries and Open Pits"; 169 pp., octavo; Hercules Powder Co., Wilmington, Del.

In this book J. Barab has brought together much important and interesting information on blasting in open pits. Starting with explosive reactions, chemical and physical, he proceeds to discuss modern explosives, blasting accessories, drills and drilling and methods of blasting. He then gives special attention to the quarries in various kinds of industry and to the blasting methods employed in each. Following that the author discusses technical records, increasing production and lowering production costs, the reduction of accidents and the building of magazines.

Six pages refer specifically to experience in strip coal mining in Kansas and the anthracite field.

Among the Manufacturers



STOCKHOLDERS of the American Brake Shoe & Foundry Co. will vote April 24 on a proposal to acquire an interest in the National Bearing Metals Corporation. It is planned to buy the preferred stock for cash and to acquire the common through exchange for Brake Shoe common.

* * *

E. D. HILL, of the Allis-Chalmers Mfg. Co., will represent the company at 42 Church Street, New Haven, Conn. The sales will be under the direction of A. F. Rolf, manager of the New York office, 50 Church Street.

* * *

THE D. O. JAMES MFG. CO., Chicago, maker of speed reducers and cut gearing, announces the addition to its sales department of R. C. Bird, in the capacity of traveling sales manager. Mr. Bird formerly was with the Chain Belt Co., Milwaukee, Wis.

* * *

THE DELTA-STAR ELECTRIC CO., Chicago, has opened a new Kansas City (Mo.) office in charge of L. C. Hitzeroth, who has been transferred from the sales-engineering division of the Chicago factory.

* * *

ROBERT S. WILSON was elected vice-president of the Goodyear Tire & Rubber Co. at a meeting of directors March 26. Mr. Wilson, who had been sales manager since Jan. 1, succeeds Frank F. Espenhain in his new post.

* * *

THE AMERICAN CAST IRON PIPE CO., Birmingham, Ala., has opened a new branch office in Pittsburgh, Pa. This office, which will handle the mining districts of Pennsylvania, West Virginia and Ohio, will have as representatives J. E. Holveck and T. L. Simpson.

* * *

HARRY HOUGH has resigned as president of the B. F. Goodrich Rubber Co. and James D. Tew, first vice-president, has been elected as his successor.

* * *

THE IDEAL COMMUTATOR DRESSER CO., Sycamore, Ill., has appointed the Syracuse Supply Co., 314 W. Fayette Street, Syracuse, N. Y., as exclusive sales representative for territory adjacent to that city.

CHARLES E. BEARDSLEY, president of the Beardsley & Wolcott Manufacturing Co., has been elected president and a director of Bridgeport Brass Co., Bridgeport, Conn., succeeding Carl F. Dietz. George T. Wigmore, Ralph E. Day, Paul D. Hamilton and Rowley Phillips replaced directors who had resigned. R. I. Reithercut, secretary, was succeeded by Mr. Wigmore, who also was elected treasurer. Walter Blatz, general manager, has retired.

* * *

C. O. BARTLETT & SNOW CO., Cleveland, Ohio, announces the appointment of W. H. Norrington as representative in New York City and vicinity. Mr. Norrington, formerly with the Robins Conveying Belt Co., will maintain his office at 30 Church St.

* * *

THE MIDEKE SUPPLY CO., 100 East Main St., Oklahoma City, Okla., was recently appointed to represent the Foote Bros. Gear & Machine Co. in Oklahoma City and vicinity.

* * *

THE BRANCH SALES OFFICE and factory of the carbon sales division of the National Carbon Co., Inc., has moved from its former location at 357 West 36th St., New York City, to new and much larger quarters at the company's plant at Fourteenth and Henderson Sts., Jersey City, N. J.

* * *

MYRON F. WESTOVER, secretary of the General Electric Co. for the past 34 years, has retired and William W. Trench, assistant secretary, has been elected to succeed him.

* * *

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., announces the appointment of R. T. Stafford, formerly district manager at Seattle, as assistant manager of the electrical department in charge of sales and engineering at the Pittsburgh (Pa.) transformer works. John Alberts, of the Seattle office, succeeds Mr. Stafford as district manager.

* * *

ROBERT J. DENEEN and Frederic Attwood were elected vice-presidents of the Ohio Brass Co. at a meeting of the board of directors held Feb. 7, 1928. Mr. Deneen is in charge of the company's sales activities in the Chicago district and Mr. Attwood is in New York in charge of the Eastern sales district.

T. M. MANLEY, who has served in various capacities for the Morse Chain Co. for about 20 years, was recently appointed manager of the district, including the Mohawk Valley, northern New York, Vermont, western Massachusetts and northeastern Pennsylvania. Mr. Manley's headquarters are at Ithaca, N. Y., the main office and works of the company.

Publications Received

Mineral Resources of the United States, 1924. Bureau of Mines, Dept. of Commerce, Washington, D. C. Part I, on Metals, has 589 pp.; Part II, Non-metals, 728 pp.

Geophysical Methods of Prospecting, by A. S. Eve and D. A. Keys. Bureau of Mines, Washington, D. C. Technical paper 420. Price, 10c. pp. 26, illustrated. A brief and elementary account of the principles involved.

Coal Mine Fatalities in the United States, 1926, by W. W. Adams, Bureau of Mines, Washington, D. C. Bulletin 283. Price, 15c. Pp. 121; tables.

Present Status of Correlation of Illinois Coals, by Harold E. Culver. Division of the State Geological Survey, Urbana, Ill. Report of Investigations—No. 14. Pp. 13.

The Estimation of Firedamp Flame Caps, by C. S. W. Grice and D. W. Woodhead. Safety in Mines Research Board, Paper No. 37. H. M. Stationery Office, Adastral House, Kingsway, London, W.C.2, England. Price, 1s. net. Pp. 8, illustrated. Describes a method of producing pictorial representations of the cap visible in a safety lamp, when, with lowered flame, it is introduced into an atmosphere containing fire-damp.

Stratigraphy and Geologic Structure of Northern Illinois, with special reference to underground water supplies, by F. T. Thwaites. Division of the State Geological Survey, Urbana, Ill. Report of Investigations No. 13. Pp. 49, illustrated.

Coke and Byproducts in 1925, by F. G. Tryon and H. L. Bennit. Bureau of Mines, Washington, D. C. Price, 15c. Pp. 80, tables.

Coke-Oven Accidents in the United States during the calendar year 1926, by W. W. Adams. Bureau of Mines, Washington, D. C. Price, 10c. Pp. 40.

Method of Trapping the Dust Produced by Pneumatic Rock Drills, by P. S. Hay. Safety in Mines Research Board, Paper No. 23. H. M. Stationery Office, Adastral House, Kingsway, London, W.C.2, England. Price, 6d. net. Pp. 18; illustrated.

Analyses of Indiana Coals. Bureau of Mines, Washington, D. C. Technical paper 417. Price, 10c. Pp. 50; tables.

WORD *from the* FIELD

Industrial Coal Stocks Shrink Five Days From Year Ago

With coal stocks in industries in the United States and Canada dropping off slightly over three million tons in February and consumption per day remaining about the same as January, production ran slightly lower per day than in the preceding month, according to a report by the National Association of Purchasing Agents. The supply of coal on hand as of March 1, 1928, on the average was sufficient for 38 days as compared with 43 days' supply a year ago. Consumption of coal is still running considerably under last year and stocks are 28 per cent lower than a year ago.

Consumption of bituminous coal during February this year, including all requirements—industries, retailers, exports, bunker, etc.—amounted to approximately 47,000,000 tons.

DAYS' SUPPLY OF COAL ON HAND IN VARIOUS INDUSTRIES

Byproduct coke.....	36
Electric utilities and coal-gas plants.....	51
Railroads.....	37
Steel mills.....	26
Other industries.....	37

COMPARATIVE ESTIMATES OF OUTPUT CONSUMPTION AND STOCKS (In Tons)

	U. S. Output	Industrial Consumption	On Hand in Industries
June.....	41,999,000	36,690,000	66,510,000
July.....	38,597,000	33,560,000	62,585,000
August.....	48,907,000	33,900,000	59,697,000
September.....	48,592,000	33,195,000	59,179,000
October.....	51,400,000	35,813,000	60,154,000
November.....	47,100,000	35,514,000	57,940,000
December.....	47,309,000	37,225,000	55,725,000
January.....	49,645,000	37,678,000	52,909,000
February.....	46,933,000	36,301,000	50,595,000
March 1.....			47,388,000

Pittsburgh Coal Co. Reports Loss of \$1,880,596

A net loss of \$1,880,596 after depreciation, depletion, interest and earnings accruing to minority interests in subsidiary companies is shown in the consolidated income account of the Pittsburgh Coal Co. and subsidiaries for 1927. This compares with a net loss of \$2,114,676 in 1926.

Gross receipts in 1927 were \$43,699,827, against \$37,258,458 in the preceding year. The surplus on Dec. 31, 1927, was \$63,051,231, against \$71,080,776 at the end of 1926, after adjustments including \$950,467 loss through scrapping of obsolete plants and equipment and \$5,090,020 difference between the par value (\$100) and the selling price of 78,803 shares of common treasury stock.

Current assets at the close of the past year were \$15,099,713 and current liabilities, \$5,506,149, leaving a working capital of \$9,593,564. The changes in



working capital during 1927 included receipts of \$4,084,157 and disbursements of \$5,765,921, or a net decrease of \$1,681,764 during the year. Total coal output was 9,128,932 net tons, against 5,042,501 tons in 1926. Total coal produced and purchased last year was 11,762,221 net tons, against 8,333,179 tons in 1926.



H. S. Gilbertson

No magic wand for Mr. Gilbertson. He believes success in labor relations depends on intelligence, understanding and patience. Years of experience in the field of industrial engineering have left him with some appreciation of what goes on in the minds of workers and owners alike. Five years ago he began to apply himself to the coal industry. His work with the Lehigh Coal & Navigation Co., particularly his work with foremen training classes, has attracted wide attention. Out of this rich background Mr. Gilbertson has prepared a series of articles for COAL AGE, the first of which, "Man Values," appears elsewhere in this issue. Others will follow.

Fuel Yards Seek Bids

Bids will be opened May 12 by the Government Fuel Yards, Washington, D. C., for supplying and delivering 9,750 gross tons of anthracite and 294,950 net tons of bituminous coal. Various sizes of both hard and soft coal are sought, deliveries to be made in irregular monthly quantities during the fiscal year ending June 30, 1929.

Hard-Coal Producers Plan 3-Year Ad Campaign

Producers of 43,000,000 tons of anthracite have joined forces to carry out an advertising campaign extending over a three-year period. Newspapers will be the principal mediums employed. The first year's expenditure will approximate \$500,000.

Plans for the campaign have been outlined in a general way, but final decisions will not be made until conferences are concluded with representatives of the retail coal merchants. The George L. Dyer Co., a New York advertising agency, has been retained to handle the campaign in co-operation with representatives of the producing companies who are bearing the entire cost.

This general advertising is in addition to co-operative advertising with groups of dealers in various localities who establish anthracite service for consumers under the guidance of the combustion engineering force maintained by the mining companies.

The companies participating in the campaign are Buck Run Coal Co. and Repplier Coal Co. (Thorne, Neale & Co.), Delaware, Lackawanna & Western Coal Co., Haddock Mining Co., Hazle Brook Coal Co., Jeddo-Highland Coal Co., Lehigh Coal & Navigation Co., Lehigh & Wilkes-Barre Coal Co., Lehigh Valley Coal Co., Madeira, Hill & Co., Northumberland Mining Co., Pennsylvania Coal Co. and Hillside Coal & Iron Co., Price-Pancoast Coal Co. and West End Coal Co. (Dickson & Eddy), Racket Brook Coal Co., Scranton Coal Co., Susquehanna Collieries Co. and Lytle Coal Co., and Weston Dodson & Co., Inc., representing Pine Hill Coal Co., Locust Mountain Coal Co. and Charles M. Dodson & Co.

Gets Shipping Board Contract

The Steamship Fuel Co., New York City, has been awarded a contract for supplying fuel required by vessels operated by the United States Shipping Board in the Port of New York for the period from May 1, 1928, to April 30, 1929. These requirements amount annually to about 180,000 gross tons of bituminous coal "suitable for use as bunker fuel for steamship operation." The successful bidder's price was \$6.04 per ton for passenger vessels and \$5.69 for freight vessels, all coal to be trimmed in bunkers.

There were seven other bidders with prices ranging from \$6.14 to \$6.68 per ton for passenger vessels and from \$5.79 to \$6.10 for freighters.

Scores Colorado Operators On Labor Set-Up

Absence of an organization of their choice, which could treat with the operators for the correction of grievances, caused the miners to accept the leadership of the I. W. W., which is blamed for the strike in the Colorado coal fields last autumn, according to a report on March 20 by the Colorado Industrial Commission. The operators, however, are held responsible for conditions which forced the miners to follow the I. W. W.

The report, which was signed by Thomas Annear, chairman, and William Young, stated that if the producer is to receive a fair return on his investment and labor an adequate wage "it would seem that some system of collective bargaining should be used." While Commissioner George Taylor did not sign the report, because of illness, the chairman said that Mr. Taylor was in agreement with its findings.

The committee in charge of the submission of testimony for the miners, the report declares, was clearly dominated by the I. W. W., which was characterized as an outlaw organization, inimical to the laws of the United States. "No attempt was made by the I. W. W. to adjust the grievances or wrongs of the miners in a lawful manner," the commission says.

The report states that some evidence was presented that would indicate intimidation on the part of some of the mine officials, though some mine officials testified that in many of the mines some men have been employed for many years and men were never discharged except for good cause. It was recommended that "the men elect a checkweighman by secret ballot and that the officials of the company take no part in such election."

It also was urged that inspection of the mines, as provided by law, be made by a committee of two, elected by the men by secret ballot, and it was suggested that the inspection committee act as a conciliation committee to settle all grievances between the operators and miners.

The commission found that the eight-hour law was persistently violated. In busy times the men sought overtime work with the consent of the operators. The report recommended rigid enforcement of the law, which provides that deviation be permitted only "in cases of emergency where life or property is in imminent danger."

The findings of the commission on the wage question, the report stated, will be reported later.

Engineers to Study Handling Of Coal Mechanically

A session devoted to mechanization of coal mines and one on handling of coal and other bulk materials will be features of the first National Materials Handling Meeting to be held by the materials handling division, American

Society of Mechanical Engineers, under the auspices of the Philadelphia section at the Benjamin Franklin Hotel, Philadelphia, April 23 and 24. The American Institute of Mining and Metallurgical Engineers, National Coal Association and Philadelphia Engineers' Club are co-operating in the meeting.

At the session on bulk handling, on the afternoon of the second day, Arthur F. Case, manager, coal and ore division, Wellman-Seaver-Morgan Co., will read a paper on "Modern Methods of Handling Coal, Ore and Other Bulk Materials"; James R. McCausland, superintendent, coal bureau and steam heat section, Philadelphia Electric Co., will describe "Methods and Equipment for Fuel Handling and Ash Disposal," and Arthur M. Quinn, engineer, the Allen-Hoff Co., will present "Handling of Ashes by a Hydraulic System."

S. Pemberton Hutchinson, former president, National Coal Association, will preside at the mine mechanization session, in the evening of April 24, when a paper on "Requirements for Complete Face Mechanization" will be read by Robert Y. Williams, consulting engineer, formerly chief engineer, Weston Dodson & Co. A number of prominent executives and engineers, including H. Foster Bain, secretary, A.I.M.E.; H. F. McCullough, director in charge of engineering, Consolidation Coal Co., and Cadwallader Evans, Jr., general manager, Hudson Coal Co., will take part in the discussion.

Obituary

JABEZ WOOLLEY, 65 years old, well known coal operator and financier, of Evansville, Ind., died at a hospital in that city March 9, following a long illness.

HUGH CRAIG, aged 82, a veteran operator in the Pittsburgh (Pa.) field, died late in March after a brief illness. He developed mines for the Pittsburgh Plate Glass Co. at Charleroi and Creighton, Pa. He retired from active business about five years ago.

S. S. MURPHEY, president of the Colorado & New Mexico Coal Operators' Association, died in Denver March 9. Mr. Murphey had been prominently identified with the coal mining industry in Colorado for the last 35 years.

WILLIAM C. SPROUL, 57, former Governor of Pennsylvania, died at his home in Chester, Pa., on March 21 after an illness of more than a year. At one time he was associated with former Governor W. A. MacCorkle of West Virginia and Joseph Chilton in the ownership of coal lands along Coal River, West Virginia, and was instrumental in building the Coal River R.R., which was later sold to the Chesapeake & Ohio Ry. He also was the moving spirit in an anthracite merger in 1924, when the Legitts Creek Anthracite Co. and the Von Storch Collieries Co. were absorbed to form the South Penn Collieries Co.

Personal Notes

I. N. BAYLESS, superintendent of the Kathleen mine of the Union Colliery Co. of St. Louis, Mo., at Dowell, Ill., has resigned. The mine has been closed for eleven months. Mr. Bayless has become general superintendent of the Utah Fuel Co., operating eleven mines in Castle-gate, Utah, and vicinity.

STEPHEN ARKWRIGHT has acquired full control of the Arkwright Coal Co., having taken over the interest of the Valley Camp Coal Co. in the former concern. Mr. Arkwright recently severed his connection with the Paisley interests, and has been succeeded by his brother, Joseph Arkwright, as general manager of the Paisley properties.

GEORGE BAUSEWINE, JR., has resigned as secretary of the Operators' Association of the Williamson Field to become associated with the Norfolk & Chesapeake Coal Co., a sales organization with offices in Cincinnati, Ohio. He joins Hugh T. Wilson, who recently resigned as president of the Red Jacket Consolidated Coal Co. Mr. Bausewine became secretary of the Williamson association in 1918.

A. H. COPELAND has resigned as general manager of the River Seam Coal Co., operating in Monongalia County, West Virginia, to become connected with the sales department of the Diamond Alkali Co., Pittsburgh, Pa. He will be succeeded as general manager by Frank Campbell, who has been the superintendent of the company.

E. F. STEVENS has been appointed manager of the Union Colliery Co.'s properties with headquarters at St. Louis, Mo.

JOHN H. TONKIN, general manager, Independent Coal & Coke Co., Salt Lake City, Utah, has been elected president of the Utah Coal Producers' Association.

HARRY WOODS, general superintendent of the Cosgrove-Meehan Coal Co., with headquarters in Marion, Williamson County, Ill., has been promoted to the position of assistant to the vice-president and general manager, in Chicago. A. S. Wilson, of Johnstown, Pa., has succeeded him as superintendent at Marion.

D. H. PAPE has relinquished the office of executive secretary of the Monongahela Coal Operators' Association, which he had filled for several years with headquarters at Morgantown, W. Va. The association planned a reorganization with a view to curtailing expenses, under which the office of executive secretary was to be abolished Oct. 1. Mr. Pape asked to be released on April 1, however, and his request was accepted. John H. Jones, president, Bertha Consumers Co., Pittsburgh, Pa., resigned at the same time as president of the association, and was succeeded by J. M. G. Brown, of Morgantown.

Mining Congress Program Committee Completes Its Work

TO SUPPLEMENT the equipment exposition sponsored by the Manufacturers' Division of the American Mining Congress in Cincinnati, May 7-11, the program committee has arranged for papers and discussions throughout the five days to make a special appeal to practical coal operating men.

Those who are interested in only one subject will be able to spend one or two days at the exposition and return home to release other members of their organizations interested in some other phase of management.

The morning of the opening day, May 7, will be devoted to registration of delegates and inspection of exhibits. The technical sessions will begin in the afternoon, with "Management and Safety Problems" as the topic. W. L. Robison, vice-president, Youghiogheny & Ohio Coal Co., will be chairman and the following papers will be presented: "Training and Selection of Personnel," H. S. Gilbertson, director of personnel, Lehigh Coal & Navigation Co.; "General Underground Supervision," H. A. Treadwell, chief engineer, Chicago, Wilmington & Franklin Coal Co.; "Advancement of Rock-Dusting Practice," Charles Enzian, mining engineer, Berwind-White Coal Mining Co., and J. E. Jones, safety engineer, Old Ben Coal Corporation; "Safety Equipment to Prevent Accidents," D. Harrington, safety engineer, U. S. Bureau of Mines. Another speaker, to be selected, will present a paper on "Handling of Supplies."

"Power and Transportation" will be the subject at the morning session of May 8, with A. C. Callen, professor of mining, University of Illinois, as chairman. These papers will be read: "Capacity and Design of Mine Cars," C. E. Watts, mechanical engineer, Berwind-White Coal Mining Co.; "Locomotives," Roy Adams, mining engineer, Old Ben Coal Corporation; "Track Systems" (speaker to be announced); "Reducing the Power Bill," James A. Erskine, electrical engineer, Monongahela Coal Operators' Association; "Pumping at the Philadelphia & Reading Coal & Iron Co.," J. T. Jennings, power engineer, P. & R. C. & I. Co.; "Supplying Power Through Automatic Substations," W. C. Shunk, general manager, Stonega Coke & Coal Co.

E. A. Holbrook, dean, School of Mines, University of Pittsburgh, will be chairman at the afternoon session on May 8, devoted to "Coal Cleaning," and these papers are scheduled: "General Principles of Cleaning Coal by the Dry Cleaning Process," Thomas Fraser, Carnegie Institute of Technology; "Dry Cleaning at the Berwind-White Coal Mining Co.," E. J. Newbaker, general manager, Berwind-White company; "Coal Cleaning at Tennessee Coal, Iron & Railroad Co.," C. E. Abbott, manager of mines, T. C. I. & R.R. Co.; "General Tipples Practice" (speaker to be selected).

The morning session of May 9 also will be devoted to "Coal Cleaning," A. B. Kelly, general manager, Humphreys Coal & Coke Co., presiding and the following papers listed: "General Principles of Coal Washing," J. B. Morrow, consulting engineer, Pittsburgh Coal Co.; "Coal Washing at the Shamokin Coal Co.," B. C. Osler, general superintendent, Shamokin Coal Co.; "Coal Washing at the American Smelting, Refining & Mining Co.," G. P. Bartholomew, general manager, coal mining department, A. S. R. M. Co.; "Cleaning Coal by the

Sand Flotation Process" (speaker to be selected).

"Development in Mechanized Mining" will hold attention at the afternoon session May 9, when Dr. L. E. Young, operating vice-president, Pittsburgh Coal Co., will be in the chair and G. B. Southward, mechanical engineer, American Mining Congress, will present "A Résumé of Present Development in Mechanization" followed by a roll call by states to show present development of mechanized mining and progress during the past year, to which responses will be made by representative mining men. Consideration will be given to "Successful



Dr. L. E. Young
Chairman, Program Committee

Mechanized Mining Operations" at the morning session on May 10, J. B. Pauley, chairman of the board, Miami Coal Co., presiding. "Entry Development with Mechanical Loaders" will be described by Jerome C. White, production engineer, Pittsburgh Coal Co.; "With Shaker Loaders," by George B. Pryde, general manager, Union Pacific Coal Co., Rock Springs, Wyo.; "With Entry Drivers," by a representative of the Chicago, Wilmington & Franklin Coal Co.; "Mechanical Loaders in Entries, Rooms and Pillars," by a speaker to be selected; "Mechanical Loaders in Entries and Rooms," by J. R. Henderson, general manager, Francisco Coal Co.; "Conveyors in Entries, Rooms and Pillars," by F. B. Dunbar, general superintendent, Hillman Coal & Coke Co.

At the afternoon session, May 10, devoted to the same general topic, with Eugene McAuliffe, president, Union Pacific Coal Co., in the chair, the first three papers will treat of "Long Face Mining"; "Mechanical Loaders in Entries and Long Faces," Lee Haskins, general superintendent, J. K. Derling Coal Co.; "Scrapers in Entries and Long Faces," W. H. Smitherman, general manager, Wet Branch Coal Co.; "Conveyors on Long Faces," W. C. Snyder, general manager, Consolidation Coal Co. In the section on "Anthracite Mining" these papers will be read: "Conveyors in Rooms," W. H. Lesser, mechanical engineer, Madeira, Hill & Co.; "Scrapers on Long Faces" and "Scrapers in Rooms," T. F. McCarthy, assistant general superintendent, Clearfield

Bituminous Coal Corporation, will describe "Rock Work with Mechanical Loaders."

"Cutting, Shearing, Snubbing and Blasting" will take up the morning session, May 11, G. M. Gillette, general manager, Consolidation Coal Co., presiding, and these papers will be read: "Cutting and Shearing" (speaker to be selected); "The Use of the CO₂ Cartridge," Paul Weir, general superintendent, Bell & Zoller Coal & Mining Co.; "Recent Developments in Drilling Equipment and Practice," Thomas Gray, assistant general superintendent, and J. T. Clark, superintendent, mechanical loading, Pittsburgh Coal Co.

Each session will close with a general discussion.

Midwest Ends Union Pact; Strippers Renew Scale

Relations between shaft-mine producers of coal in Illinois and Indiana and the United Mine Workers as an organization are at an end for the present. The operators refused to renew the Jacksonville truce agreement, but members of both state associations are permitted to make any kind of a wage agreement with individual union miners that they see fit. Strip-mine operators in the Indiana field, however, have renewed the truce contract until March 31, 1929.

The Coal Operators' Association of Illinois definitely broke with the union on March 28 at a meeting of the organization in the Auditorium Hotel, Chicago, when it was unanimously decided to cease any further joint bargaining for a wage scale as between any organized group of operators and the United Mine Workers. It was recommended, however, that the association deal with the miners' organization "to the extent of repeating its willingness to arbitrate the matter of a new wage scale and conditions."

In the meantime, the report recommended, the association's policy is "to refrain as an association from signing any state agreement except one which modifies the Jacksonville scale to such an extent that it will permit Illinois to regain its markets." The following officers were elected: W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, Mo., president; W. A. Brewerton, president, Brewerton Coal Co., Chicago, vice-president, and L. H. Smith, general manager, Spring Valley Coal Co., Chicago, secretary-treasurer.

Fifteen mines—stripping operations or mechanized shaft mines—were in operation under the Jacksonville scale in Illinois and Indiana on April 3, the first regular work day after the expiration of the old agreement. These were: Electric Coal Co., three strip mines at Danville, Ill., one at Cuba, one at Freeburg, one at Clinton, Ind., and one at Farmersburg, Ind.; Sunlight Coal Co., one strip mine at Wilmington, Ill.; one shaft at Verona, Ill., and two strip mines and one co-operative shaft at Boonville, Ind.; George A. Enos Coal Co., one strip mine at Enosville, Ind.; Marion County Coal Co., a shaft machine mine at Centralia, Ill.; Odin Coal Co., a shaft machine mine at Centralia.

Washington Letter

BY PAUL WOOTON
Special Correspondent

AS THE hearings in the inquiry into conditions in the bituminous coal fields of Pennsylvania, Ohio and West Virginia progress before the subcommittee of the interstate commerce committee of the Senate it is becoming increasingly apparent that a settlement of the coal strike cannot be legislated. As the hearing drags along it is becoming evident to the Senate that there is very little that it can do. The chances are that the testimony will come to a weary end and will not bear fruit in the form of an act of Congress.

There can be no denying that the hearings are building up sympathy with the cause of the mine workers. This is not reflected in the press alone but in the comments of members of the Senate as well.

Never, perhaps, has a lack of organization among the operators been more apparent. Their witnesses have been thrown on the defensive by being required to explain the conduct of their own individual companies. As that conduct is understandable only in the light of broad conditions that prevail in the industry as a whole, the subcommittee is losing sight of the forest in its search for the trees.

Collectively the union operators have an unanswerable case, many who are familiar with the business agree. Market conditions and the attitude of the union toward those conditions have made collective bargaining unworkable.

The only chance for legislation seems to be along the lines of restricting the use of court injunctions, as the result of a hearing held before the judiciary committee of the Senate, but that opens a much broader question than employer-employee relationships. Many who would like to restrict the use of the injunction in such cases are not willing to support legislation which necessarily would have a much more general application.

This does not mean, however, that coal will not be a political issue. To the disturbances in Pennsylvania and Ohio has been added the prospect of a long struggle in Illinois, Indiana, Iowa and perhaps other union fields. It is yet too early to know how many of

the mines will continue to pay the Jacksonville scale. In that connection it may be observed that operators who accept that offer of the union virtually abandon their claim that there must be a reduction in wages.

All indications are that thousands of union men throughout the Middle West will be on strike as interest warms up in the presidential politics. It is inevitable that there will be increasing pressure upon the administration to negotiate some settlement. Unemployment resulting from the strike will tend to negate claims of prosperity. Opponents of the administration will be quick to capitalize this phase of the situation. The policy adopted by the administration during the anthracite strike of 1925-26, when the responsibility was kept on the back of Congress, will not be so effective in a presidential year. The situation presents difficulties even should the administration undertake to bring about a settlement.

Committeemen Appointed By A.I.M.E.

At a meeting of the board of directors of the American Institute of Mining & Metallurgical Engineers, in the Engineering Societies' Building, New York City, March 30, Howard N. Eavenson was reappointed chairman of the coal and coal products committee, with John A. Garcia, Charles Dorrance, Jr.; Howard Zeller, W. H. Fulweiler and J. B. Morrow, vice-chairman of that committee and chairmen of the bituminous coal production, anthracite coal production, evaluation of coal for coke making, gas and its manufacture and coal preparation subcommittees respectively.

George S. Rice succeeds H. G. Moulton as chairman of the ground movement and subsidence committee. A. C. Callen succeeds George S. Rice as chairman of the mine ventilation committee, E. A. Holbrook being vice-chairman and H. I. Smith, secretary, as heretofore. The subcommittees have the following chairmen: Frank Haas (reappointed), coal mining; R. R. Sayers (reappointed), physiological studies; Daniel Harrington (also reappointed), metal mining; Ole Singstad, fan design and ventilation physics.

The committee on conservation of mine timber is discontinued. E. A.

Holbrook continues to be chairman of the engineering education committee, with W. B. Plank vice-chairman. A new committee on control of production is created with Harrington Emerson chairman and O. E. Kiessling, vice-chairman. Among the members of this committee is C. E. Bockus. Cornelius F. Kelly, as before, heads the mine taxation committee.

To George A. Packard falls the chairmanship of the mining methods committee, succeeding R. M. Raymond. R. V. Norris and Howard N. Eavenson continue as subcommittee chairmen for anthracite and bituminous coal respectively. C. E. Munroe becomes honorary chairman of the newly formed use of explosives subcommittee, with S. P. Howell and Theodore Marvin chairman and secretary respectively.

H. G. Moulton assumes the chairmanship of the papers and publications committee and E. Degolyer that of the membership committee with T. T. Read secretary. Walter Barnum represents the coal industry on the executive subcommittee and R. M. Lambie is a representative coal man on the general subcommittee. Van H. Manning is chairman of the committee on research.

The vice-president and director appointed to replace George O. Smith, who has been elected president, is Henry Krumb. E. A. Holbrook succeeds H. N. Eavenson, who resigned, as representative of the Institute on the American engineering standards committee. Herbert Hoover is appointed on the William Lawrence Saunders medal committee.

Walsh Joins Detroit Bank

Col. James L. Walsh has resigned as a vice-president of the McGraw-Hill Publishing Co. to become a vice-president and member of the board of directors of the Guardian Detroit Bank, Detroit, Mich. He will retain his membership on the board of directors of the McGraw-Hill organization. Prior to entering the publishing field Colonel Walsh was for many years with the Bankers Trust Co.

Coming Meetings

Ohio Section, American Institute of Mining and Metallurgical Engineers, April 21, at Columbus, Ohio. Subject: Mechanization of Coal Mines.

First National Materials Handling Meeting, held by the Materials Handling Division, American Society of Mechanical Engineers, under auspices of Philadelphia section, at Philadelphia, Pa., April 23 and 24. The American Institute of Mining and Metallurgical Engineers, National Coal Association and Philadelphia Engineers' Club are co-operating in the meeting.

American Mining Congress, manufacturers' division. Fifth annual convention and national exposition, May 7-11, Cincinnati, Ohio.

International Railway Fuel Association. Annual meeting, May 8-11, Hotel Sherman, Chicago, Ill.

Mine Inspectors' Institute of America. Annual meeting, May 14-16, Lexington, Ky.

National Coal Association. Eleventh annual meeting, May 23-25, Cleveland Hotel, Cleveland, Ohio.

Anthracite Prices at New York Effective April 1

(Per Gross Ton, F. o. b. Mine)

	Broken	Egg	Stove	Chest-nut	Pea	No. 1 Buckwheat	Rice	Barley
D., L. & W. Coal Co.	\$8.00	\$8.25	\$8.60	\$8.25	\$5.00	(a) 3.00	\$2.25	\$1.70
Lehigh & Wilkes-Barre Coal Co.	8.00	8.25	8.60	8.25	5.00	3.00	2.25	1.70
Lehigh Valley Coal Sales Co.	8.00	8.25	8.60	8.25	5.00	3.00	2.25	1.75
Hudson Coal Co.	8.00	8.25	8.60	8.25	5.00			
Phila. & Reading Coal & Iron Co.	8.00	8.25	8.60	8.25	5.00	(b) 3.00	2.25	1.75
Lehigh Coal & Navigation Co.	8.00	8.25	8.60	8.25	5.00	3.00	2.25	
Hanna & Co.		8.25	8.60	8.25	5.00	3.00	2.25	1.70
Kingston Coal Co.								
Gaylord & No. 2 Collieries		8.25	8.60	8.25	5.00			
No. 4 Colliery		8.50	8.85	8.50	5.25			
Jeddo-Highland Coal Co.								
Jeddo Coal		8.85	9.20	8.85	5.75			
Highland Coal		8.60	8.95	8.60	5.75			
Westwood Coal		8.25	8.60	8.25	5.00			

(a) Domestic buckwheat, \$3.50. (b) Domestic buckwheat, \$3.25.

Southern Mines Await Ruling Of Court in Lake Case

Operators of West Virginia, Kentucky, Virginia and Tennessee have appealed to the United States District Court for an order restraining the enforcement of the recent mandate of the Interstate Commerce Commission directing the cancelation of tariffs reducing rates on lake cargo coal from the Southern fields 20c. per net ton. Arguments on the petition for an injunction were heard at Charleston, W. Va., last month. A decision is expected before April 15.

The Commission has postponed the effective date of its order in this case until April 20. It also has amended its findings, 139 I. C. C. 367, so as to read that "the proposed rates would be unjust and unreasonable, and have not been justified." The original findings merely stated that the rates had not been justified.

In their petition for relief counsel for the Southern coal operators challenge the power of the Commission to order cancelation of rates high enough to cover cost of operation plus a reasonable return upon invested capital. They accuse the Commission of misconstruing its powers under the law and contend that, unless the reductions are permitted to become effective, Southern mines will be unable to compete to any considerable extent against their Northern rivals for the lake coal tonnage.

Counsel for the petitioners deny that a rate can be said to interfere with the rates or revenues of a competing road when the rate under attack is higher than the rate of the competing road. Raising of a rate already higher than that on a competing road or refusal to permit its reduction to a point which still will leave it higher than the charge from a competing community, it is contended, necessarily is an attempt to equalize industrial conditions or remove some natural or other handicap under which the competing community labors.

The Senate on March 16 by a vote of 39 to 29 refused to confirm the nomination of John J. Esch for reappointment as a member of the Interstate Commerce Commission. The opposition to his confirmation was led by Southern Senators who objected to his change of position in voting on the rehearing on the lake cargo case brought by the Northern operators in 1925. President Coolidge, however, has given Mr. Esch a recess appointment.

Pittston Miners Reject Peace

There is little hope of early resumption of operations at No. 6 colliery of the Pennsylvania Coal Co., at Pittston, Pa., torn for four months by factional strife which has resulted in several murders. Seven hundred members of Local 1703, United Mine Workers, voted unanimously April 4 against acceptance of a proposal by John L. Lewis, interna-

tional union president, which read: "As a constructive suggestion, we advise the membership of Local Union No. 1703 to resume work pending the settlement of this particular grievance." The miners reiterated their stand that contract mining as practiced by the company must be abolished.

Island Creek Income Mounts

The consolidated income account of the Island Creek Coal Co. for 1927 shows operating profits of \$5,227,345, compared with \$4,703,159 reported for the preceding year. Net profits after interest, depreciation, depletion and federal taxes were \$3,611,408, against \$2,924,703.

Pond Creek Pocahontas Gains

Total earnings of the Pond Creek Pocahontas Co. for 1927 were \$533,998, against \$363,527 in the preceding year. Net profits last year totaled \$210,062; compared with \$79,695 in 1926.

Cory Mann George Is Agent For Seven More Mines

Cory Mann George Corporation of New York City has become sales agent for seven mines in the Pocahontas and New River districts of West Virginia, increasing the tonnage controlled by that concern to more than 2,000,000. At the same time announcement was made of the election of William C. Dykes and W. P. Anderson as vice-presidents. The former until recently was president of Castner, Curran & Bullitt, Inc., while Mr. Anderson was president of D. L. Flack & Son, Ltd.

The new mines which have come under the control of the New York corporation are: Indian Ridge and Zenith mines, owned by the United Pocahontas Coal Co.; Miller Nos. 1 and 2, owned by the Miller Pocahontas Coal Co.; Iroquois mines, owned by the Iroquois Coal Mining Co.; Poca Pack mine, owned by the Poca Pack Coal Co.; No. 1 Cadle Ridge mine of the Cadle Ridge Coal Co.

Senate Committee Probes Soft-Coal Troubles

(Continued from page 222)

could be worked out he would be willing again to deal with the union. He agreed that collective bargaining "is practically the only way which workingmen have of dealing upon an equal footing with the employers."

Mr. Peale filed statements showing average realizations on all coal and sales to railroads by his interests during the 1919-27 period. The average realizations on all coal were \$2.614 in 1919, \$3.675 in 1920, \$3.209 in 1921, \$3.29 in 1922, \$3.088 in 1923, \$2.768 in 1924, \$2.531 in 1925, \$2.3703 in 1926 and \$2.33404 in 1927. Railroad fuel prices ranged from \$2.50 to \$4 in 1919 with the New York Central paying an average of \$2.64593 for 405,966 tons and the Pennsylvania \$2.94647 for 10,305 tons. Last year all but 65 tons of the fuel sold by the company to railroad interests went to the New York Central, which purchased 142,324 tons at an average price of \$2.089.

John W. Searles, president, Pennsylvania Coal & Coke Corporation, the first witness heard March 10, stated that his company did not feel at liberty to break or modify the wage agreement with the union "unless both sides agreed to a modification." He was unable to express definite opinions as to the comparative merits of union and non-union operation because the open-shop experiment of his company is still so new.

The witness felt that the losses his company had sustained the past four years had been due to high wage scales. Labor costs, he said, constituted approximately 80 per cent of the production cost. While the company is still losing money, Mr. Searles did not believe that situation would exist "after we get sufficiently organized." He thought he would be able to get costs down to about \$1.85, as compared with an average of

\$2.27 during the last contract period and \$2.47 in January.

"We reduced our cost in 1926 as compared with 1923 by 60c. a ton without cutting wages. We put in machinery, we spent money, we concentrated, we shut down high-cost mines and concentrated on low-cost mines and did everything we could to prove that the Jacksonville scale could be paid, and the result was that in those three years we lost \$900,000."

R. L. Wildermuth, general manager, Lorain Coal & Dock Co., said that about 25 per cent of his company's eastern Ohio output went to the railroads. Average realizations on coal sold to the Baltimore & Ohio and Cleveland, Cincinnati, Chicago & St. Louis railroads as compared with the average realization per net ton on all sales were as follows:

Year	All Sales	B. & O.	C. C. C. & St. L.
1920	\$3.345	\$3.353	\$3.430
1921	2.500	3.500	2.982
1922	2.924	3.188	2.904
1923	2.538	2.619	2.430
1924	1.900	2.170	2.130
1925	1.928	2.100	1.850
1926	1.784	1.980	1.935

During the first three months of 1927 the general average was \$1.846 and the railroads paid \$1.90.

The witness considered the Jacksonville agreement morally, if not legally, binding. His company had no intention of operating open-shop in Ohio and hoped to have all its old men back when it did resume. "Those mines," he added, "will not reopen until we are assured of a rate that will enable us to sell our coal at a profit."

Earnings under the proposed \$5 scale, he said, compared very favorably with those possible under rates in effect in railroad and general manufacturing industries. In Logan County, West

Virginia, his company was operating satisfactorily on a non-union basis with a \$4.40 base rate.

"Do you think," asked Henry Warrum, of counsel for the union, "that if the whole industry was put on the \$4.40 basis with its overdevelopment, overproduction, there would be steady employment for the men at \$4.40 a day?"

"No, I do not."

"If they were all together on that equalized basis they would be working two or three days a week, would they not?"

"Yes."

Testifying on March 10, Thomas Sage, general manager of the Roseville (Ohio) Coal Co., stated that for several years his company had sold the greater part of its output to the Pennsylvania R.R. When, following a shut-down in 1926, the witness solicited business from a Mr. Owens of the purchasing department of the railroad, he was told, he said, that Mr. Owens "would pay me or no other operator any price that would justify the Jacksonville scale."

SIMILAR testimony was given by Chester Penrod, president, Robinson Coal Co., who said Mr. Owens declared "he positively would not give any mine business that would not post notices saying that they would in no way recognize the United Mine Workers."

Frank J. Bender, secretary-treasurer of subdistrict 6 of district 6 of the United Mine Workers, declared a number of Crooksville operators had been informed that union mines could not get contracts from the Pennsylvania R.R. He also charged that the New York Central had insisted upon such low prices that a number of mines were compelled to close down.

S. H. Robbins, president of the Ohio Coal Operators' Association, was not ready to say "we exactly repudiated" contracts with the union in western Pennsylvania and northern West Virginia. In the latter section, he said, the Simpson Creek Collieries Co. had continued under the Baltimore agreement "until practically every other mine in the Fairmont district had gone non-union." He conceded a moral obligation under the Pennsylvania agreement, but questioned a legal obligation.

Senator Wheeler sharply criticized the operators for failing to meet with Governor Donahey and Secretary Davis and insisted that the operators' contention that the miners would consider nothing but a flat renewal of the Jacksonville scale at the meetings proposed by these two officials was not warranted.

Mr. Robbins admitted that the Ohio demand for a continuously competitive scale might lead to reductions below the \$5 scale offered by the operators, but thought that present wages in West Virginia were as low as they could go and still be a living wage. He defended the contracts with individual workers under non-union operations and saw nothing wrong in the terms of the Hough injunction prohibiting pickets from attempting to influence workers who had signed such agreements.

The witness thought a government commission which would assure the operators a fair profit and the workers a fair wage "might be helpful." Under such regulation, while he would not say that Ohio operators again would be willing to deal with the union, he did not think that there was "any reason why they would not."

He denied that the Pennsylvania R.R. had sought to influence the labor policies of his company or that, to his knowledge, the railroad had any representatives at the Miami conference. He denied also that he had told union officials in 1926 that he had been compelled to abrogate his union contract in northern West Virginia because the Baltimore & Ohio R.R. had taken away a fuel contract with the company.

H. L. Findlay, vice-president in charge of sales, Youghioghenny & Ohio Coal Co., also acquitted the railroads of coercive action. The Jacksonville scale, he said, probably had been discussed with the purchasing agents of the Baltimore & Ohio, New York Central and Pennsylvania lines, but "there were no conversations of any kind that anybody by the slightest stretch of imagination could interpret as coercion or as influencing our position."

Mr. Bower denied the existence of any agreement between the New York Central and other lines to depress prices or to destroy the union. He pointed out that the system was buying 1,500,000 tons annually in the union fields of Illinois and Indiana. The regions in which coal is purchased are determined by their proximity to the divisions upon which the coal is to be used. Orders are distributed among operators in a given district according to the tonnage of their commercial shipments.

THE railroads, he said, cannot pay excessive prices to producers on their lines without risking indictment for rebating. Moreover, the law requires efficient and economical operation. Therefore, the carriers cannot pay prices "clearly in excess of those brought about by market conditions, however beneficial it might be to the country generally or to other industries or however well able the railroad might be to pay them."

Mr. Warrum wanted to know whether the New York Central by absorbing extra costs charged to production by the Clearfield Bituminous Coal Corporation since the open-shop régime was inaugurated was not really "paying the expense of breaking the strike in maintaining the mines non-union."

"I suppose you could construe it that way," answered Mr. Bower.

Frank Mellott, treasurer, Schinck Coal Co., Bellaire, Ohio, said that he had been selling coal to the Baltimore & Ohio for many years. When he asked by phone for a new contract and stated he intended to continue the Jacksonville scale, he was informed, he said, by Mr. Dyson that the railroad would not be interested. The railroad shortly after shut off orders.

Thomas K. Maher, president, Maher Collieries Co., offered exhibits which

showed that the railroads paid his company more than industry generally. A summary of these data follows:

Year	Average Prices All Coal	Received Railroad	Sales Other Than Railroad
1921	\$2.47	\$2.71	\$2.40
1922	3.07	3.03	3.10
1923	2.50	2.64	2.46
1924	1.98	2.32	1.83
1925	2.05	2.09	1.78
1926	1.75	1.97	1.71
1927	1.79	1.94	1.74

Mr. Maher said he wanted a competitive wage scale, but did not favor low wages. He and other operators had appealed unsuccessfully to union officials for a modification of the scale in 1926, he said; Mr. Lewis had insisted that reducing wages was not the panacea needed.

E. D. Logsdon, president, Knox Consolidated Coal Co., submitted figures covering sales to the Pennsylvania R.R. from 1922 to 1927. His company has sold no coal to that railroad since April 1, 1927, but the witness denied that the railroad had told him buying would be resumed if the mines were put on a non-union basis. He believed, however, that, if he could meet non-union prices he could sell the Pennsylvania. On a \$5 scale he could cut the price 45c. He thought the railroad might buy on a \$1.70 mine-run basis.

H. A. Glover, vice-president in charge of sales, Knox Consolidated Coal Co., said the marketing committee of the National Coal Association had made no investigation of railroad fuel prices. Competition between operators, he believed, depressed prices more than direct attempts by railroads to force down quotations.

H. T. Brundidge, a reporter for the St. Louis Star, on March 15 described to the committee the results of investigations he had made into immoral living conditions and "bootlegging" at non-union camps in western Pennsylvania. He also offered a letter, alleged to have been sent by the Pittsburgh Coal Co. to its mine superintendents, directing them to clean up all unsightly conditions, keep the coal and iron police in the background, avoid arrests and "instruct our men to keep out of trouble" while the Senate subcommittee was in the field. Counsel for the coal company later denounced the letter as a forgery.

Wage agreements have been a stabilizing force in the industry, declared John H. Jones, president, Bertha Consumers Co. He would prefer to operate union if there were some regulatory body with power to make a final decision when operators and miners could not agree. Unless there is some relief there will be more financial wrecks in the industry this year than ever before. West Virginia and Kentucky operators are suffering as much from cutthroat competition as the operators of Pennsylvania.

"The Pennsylvania, the B. & O. and some of the larger companies," said Mr. Jones, "have told me several times that we should work out some plan whereby we could stabilize prices; that they did not want to buy their coal without a profit to the operators."

Mr. Jones criticised the lack of har-

mony in the Pittsburgh district. He accused Mr. Warden of trying to crush out the smaller producers so that the Pittsburgh Coal Co. could buy up the smaller properties "for a song."

W. R. Woodford, president, Rail & River Coal Co., controlled by the Canadian National Rys., testified on March 19 that the mines of his company had been closed from April 1, 1925, to Dec. 1, 1926, and since April 1, 1927, because the railroad could buy coal in West Virginia and Kentucky cheaper than his company could produce it. The railroad was now paying \$1.25@ \$1.35 for West Virginia coal.

Lowell F. Limpus, a reporter for the New York *Daily News*, was the only other witness heard that day. He described at length his investigations in Pennsylvania the details of which were incorporated in his news stories. Fannie Hurst, who went to the Pittsburgh district for one of the Pittsburgh newspapers, appeared on March 20. She said that the mining population was living under animal conditions. Herbert R. McCrory, of the New York *Daily News*, supplemented Mr. Limpus' testimony.

According to W. D. Reese, McKeesport, Pa., who testified March 21, nothing had been done by Governor Fisher with respect to the complaints of the union against the coal and iron police. He had, he said, been refused access to the records of appointments on the ground that these papers were "the Governor's private property."

Van Bittner, representative of the union in northern West Virginia, reviewed the labor history of that section. He introduced the records of the Baltimore conference in 1924 and described the later breaks between the union and the operators, charging the Bethlehem Mines Corporation and the Consolidation Coal Co. with repudiation of their contracts.

THE witness testified that he had taken the question up with Secretary of Commerce Hoover, who advised court action. Mr. Hoover "examined the contract," said Mr. Bittner, "and was very—said plainly that there was no question about the contract being abrogated in his mind and that they had abrogated the contract."

The union had appealed to Judge Lazzelle of the Monongahela Circuit Court for an injunction against the operators, but the injunction had been denied. Later, said the witness, the union discovered that the Lazzelle family were owners of coal lands leased to one of the defendants in the injunction proceedings and that this lease called for minimum royalty payments of \$54,000 to \$60,000 per year.

Continuing his testimony March 22, Mr. Bittner attacked absentee ownership in West Virginia, which he said controlled 80 per cent of the wealth of the state. Wages at non-union mines range from \$4.60 down to \$1.25 and board per day. Ninety-five per cent of the people in northern West Virginia, he said, appealed to Mr. Lewis and Secre-



John D. Rockefeller, Jr.

tary Davis against the destruction of the union. He also offered affidavits from sheriffs in Harrison and Marion counties stating that officials of the union had co-operated with them in preserving law and order.

Charles M. Schwab, chairman of the board, Bethlehem Steel Corporation, who appeared before the committee March 23, pled personal ignorance of the conditions under which the Bethlehem Mines Corporation had gone non-union, but stated that "I cannot believe even now, in spite of the statements made here, that our people deliberately broke that agreement." He offered, however, to have officials of the coal company familiar with the details appear before the committee.

The fundamental problem, he said, is to establish mutual understanding between employers and employees and a mutual understanding of existing conditions. The greatest possibility for temporary relief lies in inducing the surplus labor supply to find work in other industries. Modification of the Sherman law to permit price-fixing, he thought, was a palliative affording only temporary benefit.

John D. Rockefeller, Jr., who testified that he owned 27.61 per cent of the common and 71.70 per cent of the preferred stock of the Consolidation Coal Co., said he was opposed to repudiation of contracts. He had made no personal investigation but did not believe, from the information he had received, that the company had broken its agreement. He admitted that he had never read the Baltimore agreement, but believed it had been abrogated by mutual consent. "If the company violated the contract, I say the company did wrong."

AS Mr. Rockefeller views it the fundamental problem is one of overproduction. He suggested that the committee and a small group of operators attack that problem and if a change of law is necessary to make co-operation to control production legal, that proper legislation be secured. Then this joint group should call in the railroads for an attack

upon the distribution problem. This done the basis would be laid for dealing most effectively with the labor problem. But he insisted that no real progress could be made until the problem of overproduction had been solved.

R. B. Mellon, a director and former chairman of the board, Pittsburgh Coal Co., testified that it was impossible for the company to continue under the Jacksonville agreement. He had never read the contract, but approved of the open-shop policy. Mr. Mellon stated that he had never discussed the labor problems of the Pittsburgh Coal Co. with Mr. Atterbury. He defended the employment of coal and iron police.

George J. Anderson, executive vice-president, Consolidation Coal Co., testifying March 26, refused to admit his company had repudiated the Baltimore agreement. Disclaiming any anti-union complex, he said the problem must be viewed as one of management and the actions taken be judged by the results. Management sits in the center of four big interests—financial, labor, customers and the public. The public interest is not confined to local interests which may be affected directly and economically by the acts of the corporation, but includes "the larger public interest which may be affected socially and morally by the import of your actions."

IN 1924, when the Fairmont mines were operating union, the company lost money. It produced slightly less than 3,360,000 tons and employed 4,180 men an average of 131 days. The average earnings per man were \$1,195. In 1927 production was over 5,590,000 tons; 4,500 men found employment 256 days and averaged \$1,517. More men had been employed, earnings per man increased and there was more money to spend in the community. "The proof of the pudding is in the eating."

Logan County was dragged into the limelight March 27 by Capt. Percy Tetlow of the United Mine Workers, who declared it was the seat of the ills of the industry because Logan County's freedom from union penetration enabled operators there to reduce wages at will and so undersell other producers. Captain Tetlow also attacked abuses of injunctions, wholesales evictions in the Kanawha region and the company store. His proposals for federal regulation to permit consolidations and regulate prices furnished a theme of discussion for the greater part of the following day.

W. H. Conaway, co-receiver for the Brady-Warner Coal Corporation, was the first witness heard March 29. He said that, with one exception, the receivers had been unable to sell coal to the railroads except through brokers. Sales were being made at less than the cost of production. D. W. Boone, president, New River Export Smokeless Coal Co., was called upon to give his wage schedules from 1920. When he was asked to state his costs of production, counsel for southern West Virginia interests objected and participated in the legal argument which was still on when the committee recessed until April 9.

Coal-Mine Fatalities Rise in February; Two Months' Total Lower

Fatal accidents at coal mines throughout the United States during February, 1928, numbered 157, as compared with 190 during the same month last year, according to information furnished by state mine inspectors to the U. S. Bureau of Mines. Included in the 157 deaths were 123 fatalities in bituminous mines in various states and 34 in the anthracite mines of Pennsylvania.

The death rate per million tons of coal mined during the month was 3.35, based on a production of 46,933,000 tons; as compared with 3.23 for February, 1927, based on an output of 58,756,000 tons. The rate for bituminous coal alone for February, 1928, was 2.97, with a production of 41,351,000 tons, and that for anthracite was 6.09, with a tonnage of 5,582,000.

The fatality rate for the industry as a whole was slightly higher than in the preceding month and also slightly higher than in February a year ago. The bituminous rate was lower than in the previous month but higher than in February last year. The rate for anthracite mines was higher than for January but registered a decline from February a year ago.

Reports for the first two months of 1928 show that accidents at coal mines caused the loss of 321 lives. The production of coal during this period was 96,831,000 tons with a death rate of 3.32, as compared with 3.33 for the same two months of 1927, based on 407

fatalities and 122,199,000 tons produced.

Two major disasters—that is, accidents causing the loss of five or more lives—occurred during February, 1928. Both of these were explosions. On Feb. 20 twelve men were killed in a bituminous mine at Parnassus, Pa., and on Feb. 24 thirteen men were killed in a mine at Jenny Lind, Ark. These two accidents, together with one in January at West Frankfort, Ill., bring the total loss of life from major disasters in 1928 to 46. The fatality rate based exclusively on this figure was 0.475 per million tons of coal. There were no major disasters at coal mines during the first two months of 1927.

A comparison of the accident record for January and February of the present year with that for the same period of 1927 shows a reduction in the death rate from haulage accidents, explosives, and electricity; while an increase is shown for falls of roof and coal and for gas and dust explosions, the latter due to the major disasters in the present year. The comparative rates according to causes are as follows:

	Year 1927	Jan.- Feb., 1927	Jan.- Feb., 1928
All causes.....	3.704	3.331	3.315
Falls of roof and coal.....	1.907	1.637	1.704
Haulage.....	0.586	0.695	0.527
Gas or dust explosions:			
Local explosions.....	0.153	0.164	0.072
Major explosions.....	0.258	0.164	0.475
Explosives.....	0.183	0.164	0.103
Electricity.....	0.167	0.131	0.093
Other causes.....	0.450	0.540	0.341

Consolidation Profits Fall

Net profits of the Consolidation Coal Co. and subsidiaries for 1927 were \$372,945 after interest, depreciation, depletion and preferred dividends of the Carter Coal Co., equivalent to \$3.72 a share on 100,000 shares of 7 per cent preferred stock. In the preceding year the income account excluded subsidiaries and showed net profit of \$1,037,298, equivalent after allowing for full year's dividend requirements on the 7 per cent preferred stock to 83c. a share on 402,054 shares of common.

The annual report stated that directors have authorized the cancellation on the books of the company of the special appreciation arising from revaluation of coal lands as of March 31, 1913, originally established to meet apparent requirements of the tax laws and which was carried in the balance sheet at Dec. 31, 1926, at \$79,676,456. "This action," said the report, "neither indicates depreciation of asset values nor does it affect the company's earning power."

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The consolidated net income reported by the Colorado Fuel & Iron Co. and subsidiaries for the year 1927 was \$2,577,518, after interest, depreciation and federal taxes, as compared to \$2,748,414 in 1926. This was equivalent to \$7.10 a share on the 340,050 shares of \$100 par value stock after 8 per cent preferred dividends, as against \$7.60 a share in 1926.

Coal-Mine Fatalities During February, 1928, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground											Shaft				Surface						Total by States				
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Explosives.	Suffocation from mine gases.	Electricity.	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cage, skip or bucket.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity.	Machinery.	Boiler explosions or bursting steam pipes	Railway cars and locomotives.	Other causes.	Total.	1928	1927
Alabama.....	4		1									6													6	9
Alaska.....																									0	0
Arkansas.....				13								13													13	2
Colorado.....	4	1	2				1					8													8	5
Illinois.....	5			1			1					7			1		1							1	9	11
Indiana.....																									0	7
Iowa.....	1											1													1	1
Kansas.....																									0	2
Kentucky.....	3		2									5													5	16
Maryland.....																									0	0
Michigan.....																									0	0
Missouri.....	2											2													2	0
Montana.....	1											1													1	1
New Mexico.....	2		1									3													3	2
North Dakota.....																									0	2
Ohio.....	4				1							5													5	10
Oklahoma.....				3								3													3	2
Pennsylvania (bituminous).....	11	2	5	12			1					31													31	32
South Dakota.....																									0	0
Tennessee.....	3				3							6													6	0
Texas.....																									0	0
Utah.....	1		1									2													2	5
Virginia.....	1		1									2													2	5
Washington.....	2		1									3													3	2
West Virginia.....	9	2	10		1				1			23													23	35
Wyoming.....																									0	0
Total (bituminous).....	53	5	24	29	5		3		2			121													123	149
Pennsylvania (anthracite).....	13	5	4		1							28		1	1			1	2	3		1	4		34	41
Total, February, 1928.....	66	10	28	29	6		3		2			149		1	2			3	3		1	5	3		157	
Total, February, 1927.....	84	12	43	6	9		6		4			174		1	2			3	3		2	5	13		190	

Current Prices of Mining Supplies

SINCE LAST MONTH

PRICES of mining supplies, with few exceptions, are slightly above March levels at the principal cities. Cast-iron pipe recovered the decline of \$1 per ton noted in last month's issue, with consequent firmness in delivered prices. Rivets are up 15c. per 100 lb. at Pittsburgh, Cleveland and Chicago. An average rise of 3½c. per pound occurred in brattice cloth prices, compared with March quotations. Machine oil rose 1c. per gallon at Cleveland. The strength displayed by scrap copper prices in the current market is in contrast with the movement in other metals, and reflects the present unusually active demand for the red metal.

STEEL RAILS—The following quotations are per ton, f.o.b., in carloads:

	Pittsburgh	Birmingham	Chicago
Standard Bessemer rails.....	\$43.00	\$43.00	\$43.00
Standard open-hearth rails.....	43.00	43.00	43.00
Light rails, 25 to 45 lb.....	36.00	34@36	36@38

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh mill for carloads, together with warehouse prices at Chicago and Birmingham:

	Pittsburgh	Chicago	Birmingham
Standard spikes, ½-in. and larger.....	\$2.75@2.80	\$3.55	\$3.00
Track bolts.....	3.80	4.55	3.90
Standard section angle bars, splice bars or fishplates.....	2.75	3.40

WROUGHT STEEL PIPE—From warehouses at the places named the following discounts hold for welded steel pipe:

	New York	Black Chicago	St. Louis
1 to 3 in. butt welded.....	53%	54%	49%
2½ to 6 in. lap welded.....	48%	51%	46%
	New York	Galvanized Chicago	St. Louis
1 to 3 in. butt welded.....	39%	41%	36%
2½ to 6 in. lap welded.....	35%	38%	33%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches		Thickness Inches
		External	Internal	
1	\$0.17	1.315	1.049	.133
1½	.23	1.66	1.38	.14
2	.27½	1.9	1.61	.145
2½	.37	2.375	2.067	.154
3	.58½	2.875	2.469	.203
3½	.76½	3.5	3.068	.216
4	.92	4.0	3.548	.226
4½	1.09	4.5	4.026	.237
5	1.27	5.0	4.506	.247
5½	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

CAST-IRON PIPE—Prices, f.o.b., per net ton for Class B in large mill lots:

	Birmingham	Burlington, N. J.	New York
4 in.....	\$31.00	\$38.00	\$40.60
6 in. and over.....	28.00	35.00	37.60
	Pittsburgh	Chicago	St. Louis
4 in.....	\$39.50	\$39.20	\$36.60
6 in. and over.....	36.50	36.20	33.60

Gas pipe and Class "A," \$3.00 per ton extra.

BOLTS AND NUTS—Discounts from list, Apr. 1, 1927, on immediate deliveries from warehouse in New York and vicinity: Machine bolts, square heads and nuts, up to 1x30-in., full packages, 50%; Carriage bolts up to ½ x 6-in., full packages, 55%; Nuts, hot-pressed or cold-punched, blank or tapped, square or hexagonal, full packages, 55%.

STEEL PLATES—Following are base prices per 100 lb. in carloads, f.o.b., for ½-in. thick and heavier:

Pittsburgh.....	\$1.90	Birmingham.....	\$2.00
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STRUCTURAL RIVETS—The following quotations are per 100 lb., in carloads, f.o.b. mill, for ½-in.:

Pittsburgh.....	\$2.90	Cleveland.....	\$2.90	Chicago.....	\$3.00
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WIRE ROPE—Discounts from list price on regular grades of bright and galvanized, in New York and territory east of Missouri River:

	Per Cent
Plow steel round strand rope.....	35
Special steel round strand rope.....	30
Cast steel round strand rope.....	20
Round strand iron and iron tiller.....	5
Galvanized steel rigging and guy rope.....	7½
Galvanized iron rigging and guy rope (add to list).....	12½

RAIL BONDS—Stranded copper, 28-in., 4/0, B. & S. gage, are welded, at points east of the Mississippi, price per 100 net, \$90.36.

DRILL ROD—Discounts from list at warehouse:

New York.....	60%	Cleveland.....	55%	Chicago.....	50%
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FRICITION TAPE—Size ¼-in. in 100 lb. lots in Eastern territory, per lb., \$0.29

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Chicago white oak, heart, untreated.....	\$1.40	\$1.78
Chicago, oak, empty cell creosoted.....	1.80	2.40
Chicago, oak, sine treated.....	1.60	2.10
St. Louis, sap pine or cypress, untreated.....	.95@1.05	1.30@1.40
St. Louis, pine or cypress, creosoted.....	1.75	2.10
Birmingham, white oak, heart, untreated.....	1.25	1.45
Birmingham, white oak, creosoted.....	1.70	1.90

STEEL MINE TIES—Prices range from \$0.38 to \$0.60 per tie, f.o.b. Pennsylvania and West Virginia districts, depending on quantity, gage of track and weight of rail.

CALCIUM CARBIDE—In drums, round lots in New York market, per lb., \$0.05@0.06.

BRATTICE CLOTH—Prices f.o.b. cars New York, Philadelphia, St. Louis or Chicago, per sq.yd.:

Jute, 24-oz., double warp.....	\$0.20	Jute, waterproof.....	\$0.28
Jute, 22-oz., single warp.....	.17½	Duck, waterproof.....	.35
Jute, 18-oz., single warp.....	.15	Duck, non-inflammable.....	.33
Old sail cloth.....	.62		

COTTON WASTE—The following prices are in cents per lb. for bale lots:

	New York	Cleveland	Chicago
White.....	10.00@13.50	16.00	15.00
Colored.....	9.00@13.00	12.00	12.00

MACHINE OIL—Medium bodied, in 55 gal. metal barrels, per gal., as follows:

New York.....	\$0.27	Cleveland.....	\$0.36	Chicago.....	\$0.26
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SCRAP IRON AND STEEL—The prices following are f.o.b. per ton paid by dealers:

	New York Per Gross Ton	Chicago Per Net Ton	Birmingham Per Gross Ton
No. 1 railroad wrought.....	\$10.00@10.50	\$11.25@11.75	\$11.00@11.50
Stove plate.....	8.50@ 9.00	12.00@ 12.50	9.00@ 9.50
No. 1 machinery cast.....	12.50@ 14.00	13.75@ 14.25	12.50@ 14.00
Machine shop turnings.....	6.75@ 7.50	7.00@ 7.50	7.00@ 7.25
Cast borings.....	6.75@ 7.50	9.50@ 10.00	7.25@ 7.50
Railroad malleable.....	10.00	12.50@ 13.00	10.25@ 10.75
Re-rolling rails.....	10.50@ 11.00	13.50@ 14.00	10.25@ 10.75
Re-laying rails.....	23.00@ 24.00		23.00@ 24.00
Heavy melting steel.....	7.00@ 10.75	12.50@ 13.00	

SCRAP COPPER AND BRASS—Dealers' purchasing prices in cents per lb.:

	New York	Cleveland	Chicago
Crucible copper.....	12.25 @ 12.50	11.50	11.25@ 11.75
Copper, heavy, and wire... ..	11.50 @ 12.25	10.75	10.75@ 11.25
Copper, light, and bottoms..	10.25 @ 10.75	9.50	9.50@ 10.00
Brass, heavy, yellow.....	7.12½ @ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red.....	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings..	7.50 @ 8.00	7.50	7.00@ 7.50

COPPER WIRE—Prices of bare wire, base, at warehouse, in cents per lb. are as follows:

New York.....	19.37½	Cleveland.....	19.37½	Chicago (mill) 16@16½
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TROLLEY WIRE—In carload lots, f.o.b., producing point, all sizes, per lb.:

Round.....	\$0.1587½	Grooved.....	\$0.1612½	Fig. 8.....	\$0.1662½
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TROLLEY WHEELS—F.o.b. Jersey City, N. J., 4-in., \$1.00 each; 6-in., \$1.40 each.

MINING MACHINE CABLE—F.o.b. producing point, net, per M. ft.:

No. 2 Duplex Flat, Braided		Two Conductor, Round Rubber Sheathed	
Size 2.....	\$165.00	Size 2.....	\$607.00
Size 3.....	147.00	Size 3.....	512.00
Size 4.....	129.60	Size 4.....	427.00

LOCOMOTIVE CABLE—F.o.b. producing point, single conductor, braided, net, per M. ft.:

Size 3.....	\$85.00	Size 4.....	\$63.00
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FEEDER CABLE—Price per M. ft. in larger buying centers east of the Mississippi:

B. & S. Size	Two Conductor	Three Conductor
No. 14 solid.....	\$29.00 (net)	\$44.00 (net)
No. 12 solid.....	136.00	180.00
No. 10 solid.....	185.00	235.00
No. 8 stranded.....	305.00	375.00
No. 6 stranded.....	440.00	530.00

From the above lists discounts are: Less than coil lots, 50%; Coils to 1,000 ft., 60%; 1,000 to 5,000 ft., 65%; 5,000 ft. and over, 67%.

EXPLOSIVES—F.o.b. in carload lots:

Black, Powder, FF, NaNO ₃ base, 800 kegs per car, per 25 lb. keg.....	West Virginia	Districts Pennsylvania	Missouri
Ammonium permissible.	\$1.70@1.80	\$1.70	\$1.75
1½ x 8 in. sticks, 20,000 lb. per car. per 100 lb.....	14.50@15.50	14.25	14.50

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(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground										Shaft				Surface						Total by States					
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Explosives.	Suffocation from mine gases.	Electricity.	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cage, skip or bucket.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity.	Machinery.	Boiler explosions or bursting steam pipes	Railway cars and locomotives.	Other causes.	Total.	1928	1927
Alabama.....	4		1						1			6													6	9
Alaska.....																									0	0
Arkansas.....				13								13													13	2
Colorado.....	4	1	2				1					8													8	5
Illinois.....	5			1								7			1										9	11
Indiana.....																									0	7
Iowa.....	1											1													1	1
Kansas.....																									0	2
Kentucky.....	3		2									5													5	16
Maryland.....																									0	0
Michigan.....																									0	0
Missouri.....	2											2													2	0
Montana.....	1											1													1	1
New Mexico.....	2		1									3													3	2
North Dakota.....																									0	2
Ohio.....	4				1							5													5	10
Oklahoma.....				3								3													3	2
Pennsylvania (bituminous).....	11	2	5	12		1						31													31	32
South Dakota.....																									0	0
Tennessee.....	3				3							6													6	0
Texas.....																									0	0
Utah.....	1		1									2													2	5
Virginia.....	1											2													2	5
Washington.....	2											3													3	2
West Virginia.....	9	2	10		1				1			23													23	35
Wyoming.....																									0	0
Total (bituminous).....	53	5	24	29	5	3			2			121		1	1		1					1		1	123	149
Pennsylvania (anthracite).....	13	5	4		1							28		1	1			3		1			4		34	41
Total, February, 1928.....	66	10	28	29	6	3			2			149		1	2		3	3		1		1	5	157		
Total, February, 1927.....	84	12	43	6	9	6			4			174		1	2		3	3		2		5	13		190	

Current Prices of Mining Supplies

SINCE LAST MONTH

PRICES of mining supplies, with few exceptions, are slightly above March levels at the principal cities. Cast-iron pipe recovered the decline of \$1 per ton noted in last month's issue, with consequent firmness in delivered prices. Rivets are up 15c. per 100 lb. at Pittsburgh, Cleveland and Chicago. An average rise of 3½c. per pound occurred in brattice cloth prices, compared with March quotations. Machine oil rose 1c. per gallon at Cleveland. The strength displayed by scrap copper prices in the current market is in contrast with the movement in other metals, and reflects the present unusually active demand for the red metal.

STEEL RAILS—The following quotations are per ton, f.o.b., in carloads:

	Pittsburgh	Birmingham	Chicago
Standard Bessemer rails.....	\$43.00	\$43.00	\$43.00
Standard open-hearth rails.....	43.00	43.00	43.00
Light rails, 25 to 45 lb.....	36.00	34@36	36@38

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh mill for carloads, together with warehouse prices at Chicago and Birmingham:

	Pittsburgh	Chicago	Birmingham
Standard spikes, ½-in. and larger.....	\$2.75@2.80	\$3.55	\$3.00
Track bolts.....	3.80	4.55	3.90
Standard section angle bars, splice bars or fishplates.....	2.75	3.40

WROUGHT STEEL PIPE—From warehouses at the places named the following discounts hold for welded steel pipe:

	New York	Black Chicago	St. Louis
1 to 3 in. butt welded.....	53%	54%	49%
2½ to 6 in. lap welded.....	48%	51%	46%
	New York	Galvanized Chicago	St. Louis
1 to 3 in. butt welded.....	39%	41%	36%
2½ to 6 in. lap welded.....	35%	38%	33%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches		Thickness Inches
		External	Internal	
1	\$0.17	1.315	1.049	.133
1½	.23	1.66	1.38	.14
2	.27½	1.9	1.61	.145
2½	.37	2.375	2.067	.154
3	.58½	2.875	2.469	.203
3½	.76½	3.5	3.068	.216
4	.92	4.0	3.548	.226
4½	1.09	4.5	4.026	.237
5	1.27	5.0	4.506	.247
5½	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

CAST-IRON PIPE—Prices, f.o.b., per net ton for Class B in large mill lots:

	Birmingham	Burlington, N. J.	New York
4 in.....	\$31.00	\$38.00	\$40.60
6 in. and over.....	28.00	35.00	37.60
	Pittsburgh	Chicago	St. Louis
4 in.....	\$39.50	\$39.20	\$36.60
6 in. and over.....	36.50	36.20	33.60

Gas pipe and Class "A," \$3.00 per ton extra.

BOLTS AND NUTS—Discounts from list, Apr. 1, 1927, on immediate deliveries from warehouse in New York and vicinity: Machine bolts, square heads and nuts, up to 1x30-in., full packages, 50%; Carriage bolts up to 1 x 6-in., full packages, 55%; Nuts, hot-pressed or cold-punched, blank or tapped, square or hexagonal, full packages, 55%.

STEEL PLATES—Following are base prices per 100 lb. in carloads, f.o.b., for ½-in. thick and heavier:

Pittsburgh.....	\$1.90	Birmingham.....	\$2.00
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STRUCTURAL RIVETS—The following quotations are per 100 lb., in carloads, f.o.b. mill, for ½-in.:

Pittsburgh.....	\$2.90	Cleveland.....	\$2.90	Chicago.....	\$3.00
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WIRE ROPE—Discounts from list price on regular grades of bright and galvanized, in New York and territory east of Missouri River:

	Per Cent
Plow steel round strand rope.....	35
Special steel round strand rope.....	30
Cast steel round strand rope.....	20
Round strand iron and iron tiller.....	5
Galvanized steel rigging and guy rope.....	7½
Galvanized iron rigging and guy rope (add to list).....	12½

RAIL BONDS—Stranded copper, 28-in., 4/0, B. & S. gage, arc welded, at points east of the Mississippi, price per 100 net, \$90.36.

DRILL ROD—Discounts from list at warehouse:

New York.....	60%	Cleveland.....	55%	Chicago.....	50%
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FRICITION TAPE—Size ½-in. in 100 lb. lots in Eastern territory, per lb., \$0.29

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Chicago white oak, heart, untreated.....	\$1.40	\$1.78
Chicago oak, empty cell creosoted.....	1.80	2.40
Chicago oak, zinc treated.....	1.60	2.10
St. Louis, sap pine or cypress, untreated.....	.95@1.05	1.30@1.40
St. Louis, pine or cypress, creosoted.....	1.75	2.10
Birmingham, white oak, heart, untreated.....	1.25	1.45
Birmingham, white oak, creosoted.....	1.70	1.90

STEEL MINE TIES—Prices range from \$0.38 to \$0.60 per tie, f.o.b. Pennsylvania and West Virginia districts, depending on quantity, gage of track and weight of rail.

CALCIUM CARBIDE—In drums, round lots in New York market, per lb., \$0.05@0.06.

BRATTICE CLOTH—Prices f.o.b. cars New York, Philadelphia, St. Louis or Chicago, per sq.yd.:

Jute, 24-oz., double warp.....	\$0.20	Jute, waterproof.....	\$0.28
Jute, 22-oz., single warp.....	.17½	Duck, waterproof.....	.35
Jute, 18-oz., single warp.....	.15	Duck, non-inflammable.....	.33
Old sail cloth.....	.62		

COTTON WASTE—The following prices are in cents per lb. for bale lots:

	New York	Cleveland	Chicago
White.....	10.00@13.50	16.00	15.00
Colored.....	9.00@13.00	12.00	12.00

MACHINE OIL—Medium bodied, in 55 gal. metal barrels, per gal., as follows:

New York.....	\$0.27	Cleveland.....	\$0.36	Chicago.....	\$0.26
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SCRAP IRON AND STEEL—The prices following are f.o.b. per ton paid by dealers:

	New York Per Gross Ton	Chicago Per Net Ton	Birmingham Per Gross Ton
No. 1 railroad wrought.....	\$10.00@10.50	\$11.25@11.75	\$11.00@11.50
Stove plate.....	8.50@ 9.00	12.00@ 12.50	9.00@ 9.50
No. 1 machinery cast.....	12.50@ 14.00	13.75@ 14.25	12.50@ 14.00
Machine shop turnings.....	6.75@ 7.50	7.00@ 7.50	7.00@ 7.25
Cast borings.....	6.75@ 7.50	9.50@ 10.00	7.25@ 7.50
Railroad malleable.....	10.00	12.50@ 13.00	10.25@ 10.75
Re-rolling rails.....	10.50@ 11.00	13.50@ 14.00	10.25@ 10.75
Re-laying rails.....	23.00@ 24.00		23.00@ 24.00
Heavy melting steel.....	7.00@ 10.75	12.50@ 13.00	

SCRAP COPPER AND BRASS—Dealers' purchasing prices in cents per lb.:

	New York	Cleveland	Chicago
Crucible copper.....	12.25 @ 12.50	11.50	11.25@ 11.75
Copper, heavy, and wire.....	11.50 @ 12.25	10.75	10.75@ 11.25
Copper, light, and bottoms.....	10.25 @ 10.75	9.50	9.50@ 10.00
Brass, heavy, yellow.....	7.12½ @ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red.....	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings.....	7.50 @ 8.00	7.50	7.00@ 7.50

COPPER WIRE—Prices of bare wire, base, at warehouse, in cents per lb. are as follows:

New York.....	19.37½	Cleveland.....	19.37½	Chicago (mill)	16@16½
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TROLLEY WIRE—In carload lots, f.o.b., producing point, all sizes, per lb.:

Round.....	\$0.1587½	Grooved.....	\$0.1612½	Fig. 8.....	\$0.1662½
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TROLLEY WHEELS—F.o.b. Jersey City, N. J., 4-in., \$1.00 each; 6-in., \$1.40 each.

MINING MACHINE CABLE—F.o.b. producing point, net, per M. ft.:

No. 2 Duplex Flat, Braided		Two Conductor, Round Rubber Sheathed	
Size 2	\$165.00	Size 2	\$607.00
Size 3	147.00	Size 3	512.00
Size 4	129.60	Size 4	427.00

LOCOMOTIVE CABLE—F.o.b. producing point, single conductor, braided, net, per M. ft.:

Size 3.....	\$85.00	Size 4.....	\$63.00
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FEEDER CABLE—Price per M. ft. in larger buying centers east of the Mississippi:

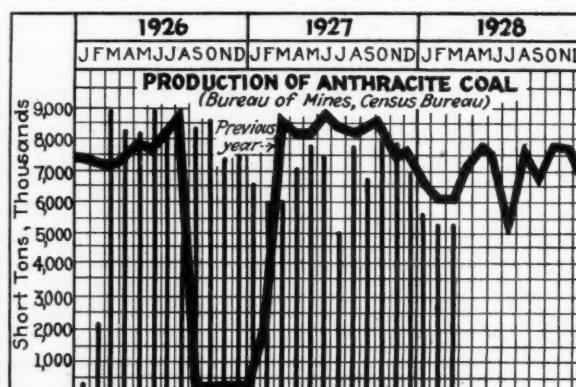
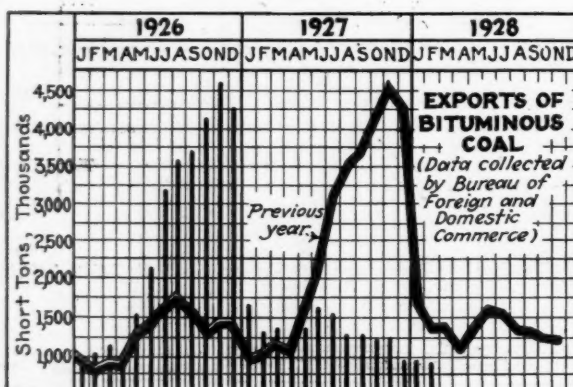
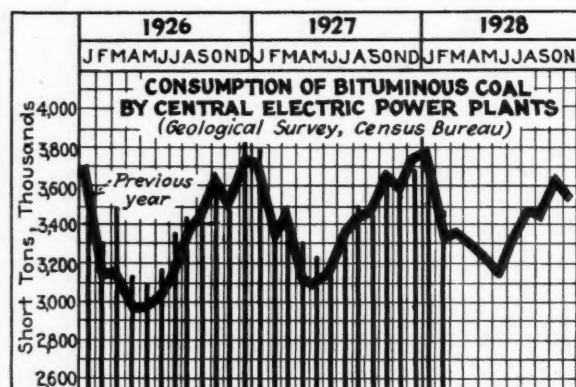
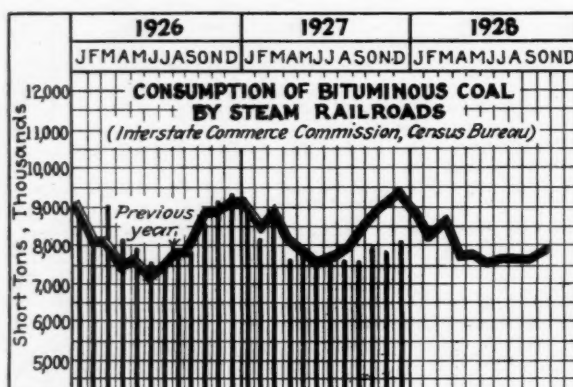
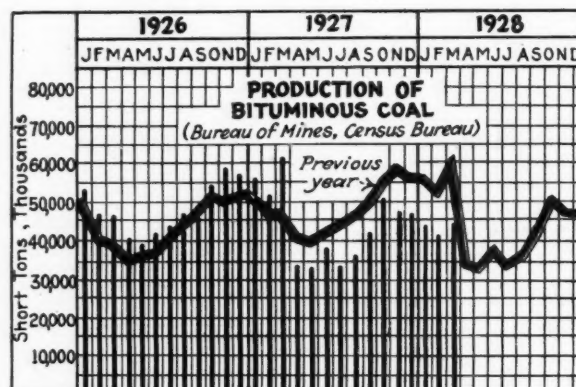
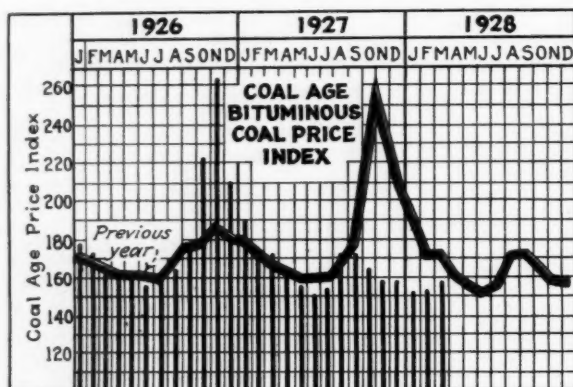
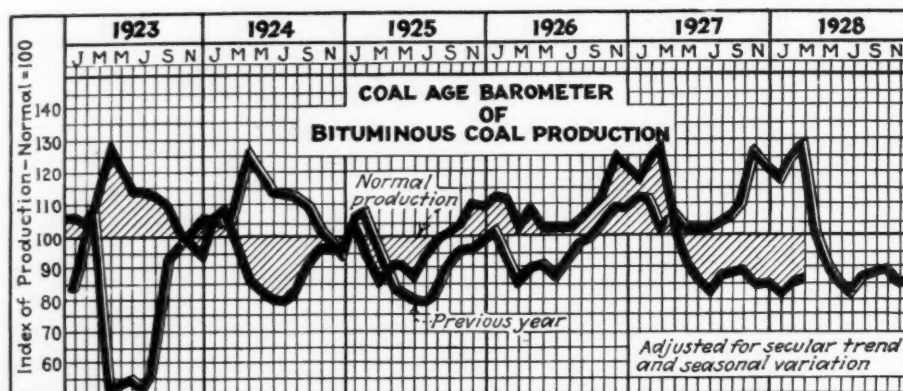
	B. & S. Size	Two Conductor	Three Conductor
No. 14 solid.....		\$29.00 (net)	\$44.00 (net)
No. 12 solid.....		136.00	180.00
No. 10 solid.....		185.00	235.00
No. 8 stranded.....		305.00	375.00
No. 6 stranded.....		440.00	530.00

From the above lists discounts are: Less than coil lots, 50%; Coils to 1,000 ft., 60%; 1,000 to 5,000 ft., 65%; 5,000 ft. and over, 67%.

EXPLOSIVES—F.o.b. in carload lots:

	Black, Powder, FF, NaNO ₃ base, 800 kegs per car, per 25 lb. keg.....	West Virginia	Districts: Pennsylvania	Missouri
Ammonium permissible.		\$1.70@1.80	\$1.70	\$1.75
1½ x 8 in. sticks, 20,000 lb. per car, per 100 lb.....		14.50@15.50	14.25	14.50

Indicators of Activities in the Coal Industry



MARKETS

in Review

BITUMINOUS coal markets of the United States last month were dead to the spotlight thrown upon the soft-coal industry by the investigations now being conducted at Washington by the Senate committee on interstate commerce. The shadow of a renewed tie-up in the remnants of the fields still recognizing the United Mine Workers also was without marked effect. On the whole the coal-buying public pursued the even tenor of its way, purchasing only as immediate necessities and not future possibilities dictated.

Toward the end of the month, it is true, there was a sharp upward movement in slack prices in the Southern and western Kentucky areas which carried the average spot price for all grades to \$2.05—the highest average in six months. But this probably was due more to the slump in the market upon prepared sizes than to any increased buying by industrial consumers normally drawing their fuel supplies from the strike zone.

Up until this month-end spurt average prices moved in a narrow range. *Coal Age* Index of spot bituminous prices on March 3 was 155; on March 10 it was 156; on March 17 it dropped back to 155, rising again to 156 on March 24 and to 169 on March 31. The corresponding weighted average prices were \$1.88, \$1.89, \$1.88, \$1.89 and \$2.05. Illinois levels were lower at the close of the month than at the beginning.

INDIFFERENCE to the labor situation in the Illinois and Indiana sectors marked the attitude of Middle Western buyers the greater part of last month. Steam plants were confident

that there would be plenty of coal available after April 1 regardless of how many mines went down in the union regions. Retail distributors found no incentive in either demand from the consumer or the strike possibilities to encourage any building up of stocks.

Industries placing orders in the Chicago market bought sparingly for storage. The average plant appeared content with a month's reserves and Illinois operators did not advise the accumulation of heavier stocks. In fact some interests expressed a willingness to continue to look after the trade with Illinois and Indiana coal during April. Western Kentucky producers were bullish on the prospects, but buyers did not share in their optimism.

The smokeless shippers signalized the new coal year with reductions of 25c. on mine-run contracts for April and 50 to 75c. on lump and egg; stove and nut were cut 25c. April anthracite prices made cuts of 40c. to \$1.15 on company sizes and 21c. to \$1.15 on independent tonnage, with pea bearing the sharpest reduction. The new schedules show egg and nut at \$7.38 per net ton; stove, \$7.68; pea, \$4.45@4.48; buckwheat, \$2.68@2.70.

CONTRACT shipments of smokeless coal to the Chicago market in March were approximately 50 per cent of normal. Aside from egg, spot offers were easy throughout the month and some producers applied prepared sizes on mine-run contracts. Midwestern domestic coals were weak. The ordinary run of screenings sold at \$3.15@3.25, f.o.b. Chicago; the best grades commanded \$3.65@3.75. Most of the spot buying

was by interests with consumer contracts.

Nothing approaching normal pre-strike activity was present in the St. Louis market the past month. As a matter of fact most of the mines serving that territory were embarrassed with "no bills" of all sizes. Stocks in the hands of large consumers in the St. Louis area are estimated to be sufficient to last plants 60 days on the basis of current industrial operations. Western Kentucky shippers have been making a drive for business at pre-strike prices.

A few public utilities and large industrials were liberal purchasers of screenings in the Kentucky field last month—not because of the labor situation but because experience has taught them that the spring slump in domestic demand means a tightening in the fine-coal market. Some of the Northern lines also took on additional tonnages of railroad fuel while general traffic was less heavy on their rails. There were a number of contract renewals at figures approximating those of 1927-28.

THE CLOSE of March, however, did bring a stronger tone to the slack market in both the eastern and western sections of the state. This was reflected in higher prices at Louisville and Cincinnati, but Chicago ranges were unchanged. Mine-run was slightly firmer but prepared sizes were weaker. There has been no frantic month-end buying. Running time at the mines during March averaged about three days per week. Little, if any, increase in volume is anticipated in the next few weeks.

A continued active demand from in-

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

Market Quoted		March 3, 1928		Mar. 10, 1928 Independent	Week Ended Mar. 17, 1928		Mar. 24, 1928 Independent	March 31, 1928	
		Independent	Company		Independent	Independent		Independent	Company
Broken.	New York.		\$8.25@8.75					\$8.25@8.75	
Broken.	Philadelphia.	\$8.50@8.75	8.25@8.50	\$8.50@8.75	\$8.50@8.75	\$8.50@8.75	\$8.50@8.75	8.25@8.50	
Egg.	New York.	8.35@8.60	8.75	8.35@8.60	8.25@8.75	8.25@8.75	8.50@8.75	8.75	
Egg.	Philadelphia.	8.75@9.30	8.75@8.85	8.75@9.30	8.75@9.30	8.75@9.30	8.75@9.30	8.75@8.85	
Egg.	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	
Stove.	New York.	8.50@9.00	9.25	8.50@9.00	8.75@9.25	8.60@9.25	8.60@9.25	9.25	
Stove.	Philadelphia.	9.25@9.75	9.25	9.25@9.75	9.25@9.75	9.25@9.75	9.25@9.75	9.25	
Stove.	Chicago*	8.58	8.58	8.58	8.58	8.58	8.58	8.58	
Chestnut.	New York.	8.45@8.75	8.75	8.45@8.75	8.25@8.75	8.25@8.75	8.25@8.75	8.75	
Chestnut.	Philadelphia.	8.75@9.25	8.75	8.75@9.25	8.75@9.25	8.75@9.25	8.75@9.25	8.75	
Chestnut.	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	
Pea.	New York.	5.00@6.00	6.00@6.25	5.00@6.00	5.50@6.00	5.50@6.00	5.50@6.00	6.00@6.25	
Pea.	Philadelphia.	5.75@6.50	6.00	5.75@6.50	5.75@6.50	5.75@6.50	5.75@6.50	6.50	
Pea.	Chicago*	6.10	6.10	6.10	6.10	6.10	6.10	6.10	
Buckwheat No. 1.	New York.	2.75@3.25	3.00@3.25	2.75@3.25	3.00@3.25	2.75@3.25	3.00@3.25	3.00@3.25	
Buckwheat No. 1.	Philadelphia.	3.00@3.50	3.00@3.25	3.00@3.50	3.00@3.50	3.00@3.50	3.00@3.50	3.00@3.25	
Rice.	New York.	2.00@2.25	2.00@2.25	2.00@2.25	2.15@2.25	2.10@2.25	2.10@2.25	2.00@2.25	
Rice.	Philadelphia.	2.00@2.25	2.00@2.15	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.15	
Barley.	New York.	1.35@1.75	1.50@1.75	1.35@1.75	1.40@1.60	1.40@1.60	1.50@1.75	1.50@1.75	
Barley.	Philadelphia.	1.50@1.75	1.50@1.60	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.60	
Birdseye.	New York.		1.60			1.40@1.45		1.60	

*Net tons, f.o.b. mines. †Domestic buckwheat (D. L. & W.), \$3.75.

dustrial companies for steam coal was the outstanding feature of the market at the Head of the Lakes during March. The improvement in industrial demand counterbalanced to some extent the decline in the movement of coal to retail distributors. Preliminary estimates of shipments indicate that the total will show a substantial gain over the figures for March, 1927, when 14,646 cars were shipped.

Dock stocks on March 15 were reported at 2,225,000 tons of bituminous coal and 490,000 tons of anthracite. Sales officials of the dock companies estimate that the bituminous carry-over will be down to approximately 1,750,000 tons by May 1, when the new navigation season officially opens. Dock interests are counting upon bringing up about 10,000,000 tons of soft coal during the coming season. The anthracite carry-over probably will be close to 300,000 tons.

PPRICE stability is looked forward to this year, as all interests were well pleased with the manner in which prices were maintained during the past season. Quotations last month were as follows: Pocahontas lump, egg and stove, \$8; mine-run, \$5.75; screenings, \$4.75; Kentucky lump, egg and stove, \$6.50@7.25; dock-run, \$5.75; screenings, \$4.75; Hocking, Youghiogheny and splint lump and egg, \$5.75; dock-run, \$5.25; screenings, \$4.50. Youghiogheny and splint stove was \$5.50; Hocking stove, \$5.75.

There were increases of 25 to 50c. in

the prices on Kansas screenings last month, but quotations on domestic sizes, which moved slowly, were unchanged. For the Southwest as a whole running time was two to four days a week, with the Arkansas semi-anthracite field leading because of spring storage buying by the retail trade. With Arkansas, Oklahoma and the greater part of Missouri non-union, consumers showed little concern over the April 1 labor upset.

The domestic market in the Rocky Mountain states has been largely a weather proposition during the past month. Orders have not come in rapidly enough to warrant full-time operation. Toward the close of the month, however, improvement was noted in the Colorado field—an improvement due in part to the exhaustion of the stocks purchased from other states last year when the Colorado strike was at its peak. Utah slack has been weak, with "no bills" heavy.

MARCH usually is the time of upsets in the Cincinnati market. Last month was no exception to the rule although the fluctuations were less violent than some had feared. The breaks in prices were postponed until late in the period. Movement through the Cincinnati gateway swung between 11,000 and 13,000 carloads weekly. The total, of course, was considerably under 1927 averages, but last year lake movement was under way and pre-strike buying was brisk.

The sharpest drop in prices hit low-volatile coals. Prepared sizes slumped

\$1. Mine-run also was easier. Slack, on the other hand, gained in strength. Some tonnage was obtainable early in the month as low as 50c. but toward the close of the month prices had doubled with standard grades commanding up to \$1.25 in the spot market and contract tonnage firmly held at \$1.50.

The uncertainty with respect to rates on lake cargo coal from the South this season has had a bad effect upon the high-volatile market. With the announcement that no court decision on the recent order of the Interstate Commerce Commission could be had before mid-April buying for the lakes automatically came to a stop. All-rail demand for prepared coal was dependent upon the weather. Mine-run was torpid. As in the low-volatile division, the upward movement in slack prices was the most cheering feature of the month.

EXTREME dullness marked the course of the Columbus trade the latter part of March. Prices fell to the lowest levels which have prevailed since the protracted slump. Screenings alone escaped—not because of any intrinsic strength in demand but because of the weakness in prepared coals, which cut into production. Retailers bought only on a hand-to-mouth basis. Contract renewals have not advanced beyond the talking stage as most large consumers feel the spot supplies will be ample.

One favorable feature, however, is the practical absence of distress tonnage. Shippers are discovering the wisdom of holding unbilled loads at the mines. No

particular progress is being made in non-union production in the Ohio fields. Open-shop mines are running in the Pomeroy Bend section and in the No. 8 field but the output is not growing. Considerable disorder prevails at many eastern Ohio operations as non-union workers and union sympathizers clash.

Like Cincinnati, Pittsburgh is awaiting the outcome of the court fight on lake cargo rates to see which way orders for tonnage will fall. In the meantime, however, lake business is being placed in dribbles. Two of the larger producers have received some business, but at least one order for 50,000 tons went to the Fairmont field on a competitive purchase. A number of general industrial contracts were placed, including one steel company order for 1,000,000 tons and another for 450,000 tons.

CENTRAL Pennsylvania conditions were uninspiring last month. Spot orders were none too plentiful and price levels were unsatisfactory. Some operators, however, believe that the situation will be improved this month. This belief is based on the

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F.O.B. Mines

LOW-VOLATILE, EASTERN		Market Quoted	Mar. 3, 1928	Mar. 10, 1928	Week Ended Mar. 17, 1928	Mar. 24, 1928	Mar. 31, 1928
Smokeless lump.....	Columbus	\$3.50@3.75	\$3.50@3.75	\$3.50@3.75	\$3.50@3.75	\$3.50@3.75	\$3.50@3.75
Smokeless mine-run.....	Columbus	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Smokeless screenings.....	Columbus	.50@1.00	.60@1.00	.60@1.00	.85@1.00	.85@1.00	.85@1.00
Smokeless lump.....	Chicago	3.50@3.75	3.50@3.75	3.50@3.75	3.50@3.75	3.50@3.75	3.50@3.75
Smokeless mine-run.....	Chicago	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25
Smokeless lump.....	Cincinnati	3.50@4.00	3.50@3.75	3.40@3.75	3.25@3.50	2.50@3.00	2.50@3.00
Smokeless mine-run.....	Cincinnati	2.00@2.25	1.85@2.25	1.85@2.25	1.85@2.25	1.75@2.00	1.75@2.00
Smokeless screenings.....	Cincinnati	.50@1.25	.50@1.25	.75@1.25	.65@1.25	1.00@1.50	1.00@1.50
*Smokeless mine-run.....	Boston	3.75@4.10	3.75@4.00	3.75@4.00	3.75@4.00	3.70@3.90	3.70@3.90
Clearfield mine-run.....	Boston	1.65@1.85	1.65@1.90	1.70@1.90	1.70@1.90	1.70@1.90	1.70@1.90
Cambrist mine-run.....	Boston	2.00@2.25	2.00@2.25	2.00@2.30	2.00@2.30	2.00@2.30	2.00@2.30
Somerset mine-run.....	Boston	1.75@2.10	1.70@2.10	1.75@2.10	1.75@2.10	1.75@2.10	1.75@2.10
Pool 1 (Navy Standard)....	New York	2.40@2.65	2.40@2.65	2.35@2.75	2.35@2.70	2.50@2.60	2.50@2.60
Pool 1 (Navy Standard)....	Philadelphia	2.45@2.70	2.35@2.65	2.30@2.65	2.30@2.65	2.30@2.65	2.30@2.65
Pool 1 (Navy Standard)....	Baltimore	2.15@2.25	2.15@2.25	2.25@2.30	2.15@2.25	2.10@2.20	2.10@2.20
Pool 9 (super low vol.)....	New York	1.90@2.15	1.90@2.15	1.90@2.15	1.90@2.15	1.90@2.15	1.90@2.15
Pool 9 (super low vol.)....	Philadelphia	1.95@2.25	1.95@2.25	1.90@2.15	1.90@2.15	1.90@2.15	1.90@2.15
Pool 9 (super low vol.)....	Baltimore	1.75@1.80	1.75@1.80	1.80@1.90	1.75@1.80	1.70@1.75	1.70@1.75
Pool 10 (h. gr. low vol.)....	New York	1.65@1.90	1.65@1.90	1.65@1.90	1.65@1.90	1.60@1.90	1.60@1.90
Pool 10 (h. gr. low vol.)....	Philadelphia	1.65@1.85	1.65@1.85	1.65@1.85	1.65@1.85	1.65@1.85	1.65@1.85
Pool 10 (h. gr. low vol.)....	Baltimore	1.50@1.65	1.50@1.65	1.55@1.75	1.50@1.65	1.45@1.55	1.45@1.55
Pool 11 (low vol.).....	New York	1.50@1.75	1.50@1.75	1.50@1.65	1.50@1.65	1.40@1.75	1.40@1.75
Pool 11 (low vol.).....	Philadelphia	1.60@1.75	1.60@1.75	1.55@1.75	1.55@1.75	1.55@1.75	1.55@1.75
Pool 11 (low vol.).....	Baltimore	1.40@1.50	1.40@1.50	1.45@1.55	1.40@1.50	1.35@1.40	1.35@1.40
HIGH-VOLATILE, EASTERN							
Pool 54-64 (gas and st.)....	New York	\$1.35@1.40	\$1.25@1.40	\$1.25@1.40	\$1.25@1.40	\$1.25@1.40	\$1.25@1.40
Pool 54-64 (gas and st.)....	Philadelphia	1.25@1.60	1.25@1.60	1.25@1.60	1.20@1.55	1.20@1.55	1.20@1.55
Pool 54-64 (gas and st.)....	Baltimore	1.20@1.40	1.20@1.40	1.25@1.50	1.25@1.50	1.30@1.35	1.30@1.35
Pittsburgh sc'd gas.....	Pittsburgh	1.95@2.10	2.00@2.10	2.00@2.10	1.95@2.10	2.00@2.10	2.00@2.10
Pittsburgh gas mine-run.....	Pittsburgh	1.75@1.85	1.75@1.85	1.75@1.85	1.75@1.90	1.75@1.90	1.75@1.90
Pittsburgh st. mine-run.....	Pittsburgh	1.40@1.80	1.40@1.80	1.40@1.80	1.40@1.80	1.40@1.80	1.40@1.80
Pittsburgh gas slack.....	Pittsburgh	1.00@1.10	1.05@1.10	1.00@1.15	1.00@1.10	1.00@1.10	1.00@1.10
Kanawha lump.....	Columbus	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25	1.75@2.25
Kanawha mine-run.....	Columbus	1.25@1.60	1.25@1.60	1.25@1.60	1.25@1.60	1.25@1.60	1.25@1.60
Kanawha screenings.....	Columbus	.50@1.00	.60@1.00	.60@1.00	.85@1.00	.85@1.00	.85@1.00
W. Va. lump.....	Cincinnati	2.00@3.00	1.75@2.75	1.75@2.75	1.75@2.75	1.75@2.75	1.75@2.75
W. Va. gas mine-run.....	Cincinnati	1.40@1.65	1.35@1.50	1.35@1.75	1.50@1.75	1.40@1.75	1.40@1.75
W. Va. steam mine-run.....	Cincinnati	1.15@1.50	1.25@1.35	1.25@1.40	1.25@1.50	1.35@1.40	1.35@1.40
W. Va. screenings.....	Cincinnati	.50@1.00	.65@1.10	.75@1.10	.65@1.10	1.00@1.25	1.00@1.25
Hocking lump.....	Columbus	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Hocking mine-run.....	Columbus	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75
Hocking screenings.....	Columbus	1.00@1.25	1.05@1.25	1.05@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Pitts. No. 8 lump.....	Cleveland	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Pitts. No. 8 mine-run.....	Cleveland	1.25@1.65	1.25@1.65	1.25@1.70	1.25@1.70	1.25@1.70	1.25@1.70
Pitts. No. 8 screenings.....	Cleveland	.90@1.20	.90@1.20	1.00@1.20	1.00@1.25	1.00@1.25	1.00@1.25

*Gross tons, f. o. b. vessel, Hampton Roads.

theory that the abandonment of the Jacksonville wage basis puts the former union operators in this field in a better position to compete for contracts against the other producers in the region and against West Virginia.

New England buyers are still apathetic. Contracts are more and more restricted to a few large agencies, so that less is heard of broad price movements. Smaller factors, however, have tonnages which they are under constant pressure to sell and the prices at which they offer this coal are seized upon by purchasing agents as criteria for new contracts. Pool 1 coal is to be had in the open market as low as \$3.70@3.75 per gross ton, f.o.b. Hampton Roads.

The larger agencies are making a determined effort to switch some business from mine-run to nut-and-slack. Most of the larger consumers have equipment to burn the latter size and smaller plants now are being urged to put in stoker equipment. Lower prices are held out as the inducement for the change, made necessary from the producer's standpoint by the increasing call in other markets for prepared sizes of coal.

THE bituminous market at New York continues inactive. There is little spot business to be had but a steady movement of contract tonnages. Sellers, nevertheless, are optimistic. This optimism is based upon the dwindling stockpiles in the hands of the consumers. A number of contracts have been renewed, in some cases for larger tonnages. The railroads in this section are reported to have about completed their arrangements for the season's supply of locomotive fuel.

Contract customers in the Philadelphia market appeared reluctant to renew their orders last month. For the past few years the number of plants which have relied upon the spot market for requirements has been increasing; this season promises a further augmentation. Chief support to the contract market has come from the railroads and the public utilities. As usual, complaint is heard in the trade of the prices at which the railroad business has been taken. Spot prices are softer.

Conditions in the Baltimore market during March were highly unsatisfactory. Contract business developing was subnormal. In spot trade it was a constant fight upon the part of shippers to place tonnage. Although price ranges showed no great variation there was frequent fluctuation within the range and a number of distress sales under the low figures of the nominal range. Purchasers took full advantage of the situation, further upsetting the market by forcing many shippers to seek new outlets for their coal.

BIRMINGHAM reported a marked weakness in the demand for all grades of steam coal last month. Spot buying probably was more restricted than has been the case for many moons and prices were forced to lower levels as concessions were made by the smaller operators. Southern carriers asked for bids, but no announcement of the actual placement of orders has been made public. There were some renewals on bunker business but little new tonnage in sight.

Domestic demand was semi-active following the announcement of spring prices on March 19. Some dealers contracted for fair tonnages at that time and then lost further interest in the market. The new schedules represent reductions of 25c. under 1927 figures. Big Seam lump is \$1.75; Carbon Hill, \$2.50; Cahaba, \$3.50@3.75; Black Creek, \$3.50@3.75; Montevallo, \$4@4.75; Corona, \$2.75. Egg sizes are 15 to 25c. under the lump quotations; nut, 50c.

The New York anthracite market last month was more interested in April prices than in season-end business. Weather conditions on the whole were too lamblike to cause any uneasiness upon the part of the householder, and consumer orders were confined to small lots. Line trade, however, was in better shape. The new prices announced on March 29 represent reductions ranging from 25c. on broken coal to \$1.25 on pea. These schedules are published elsewhere in this issue.

RETAIL trade in Philadelphia fared better in March than did the wholesale demand. Weather the greater part of the month encouraged household consumption but retail distributors held down their stockpiles—possibly because

there was no break in company mine prices prior to the first of April. The general run of these latter quotations is: Stove, \$8.60 per gross ton; egg and nut, \$8.25; pea, \$5; buckwheat, \$3; rice, \$2.25; barley, \$1.75. The domestic prices, it is understood, will be advanced 10c. monthly until September.

Operators lost considerable working time during the month because the dealers refused to increase their stocks prior to the April reduction. Tonnage was accumulated on cars in anticipation of April orders. Nut led in demand last month but a wider market is promised pea. Steam sizes were in a comfortable position because of curtailed output. Shippers are less eager to contract the major part of their steam output for 1928-29.

Preliminary estimates of bituminous production for March, made by the U. S. Bureau of Mines, place the total at 44,116,000 net tons, as compared with 41,351,000 tons in February and 60,147,000 tons in March, 1927. The average daily output was 1,634,000 tons. In February it was 1,661,000 tons and in March, 1927, 2,228,000 tons.

ANTHRACITE output last month approximated 5,481,000 net tons, as compared with 5,582,000 tons in February and 6,098,000 tons in March, 1927. Beehive coke output increased from 390,000 tons in February to 448,000 tons in March. In March, 1927, however, the total was 890,000 tons. Bituminous exports last month dropped to 796,137 gross tons; anthracite exports were 223,998 tons, and coke, 76,216 tons.

As usual, the heaviest shipments in February went to Canada, which took 603,185 gross tons of soft coal and 218,494 tons of anthracite.

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F.O.B. Mines

		Market Quoted	Mar. 3, 1928	Mar. 10, 1928	Week Ended Mar. 17, 1928	Mar. 24, 1928	Mar. 31, 1928
MIDWEST							
Franklin (Ill.) lump.....	Chicago	\$2.75	\$2.50@2.75	\$2.50@2.75	\$2.50@2.75	\$2.50@2.75	\$2.50@2.75
Franklin (Ill.) mine-run.....	Chicago	2.25@2.40	2.25@2.40	2.25@2.40	2.25@2.40	2.25@2.40	2.25@2.40
Franklin (Ill.) screenings.....	Chicago	1.75@1.90	1.75@1.90	1.75@1.90	1.75@1.90	1.75@1.90	1.75@1.90
Central (Ill.) lump.....	Chicago	2.50@2.65	2.45@2.65	2.45@2.65	2.45@2.65	2.45@2.65	2.45@2.65
Central (Ill.) mine-run.....	Chicago	2.10@2.25	2.10@2.25	2.10@2.25	2.10@2.25	2.10@2.25	2.10@2.25
Central (Ill.) screenings.....	Chicago	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75
Ind. 4th Vein Lump.....	Chicago	2.50@3.00	2.50@3.00	2.50@3.00	2.50@3.00	2.50@3.00	2.50@3.00
Ind. 4th Vein mine-run.....	Chicago	1.65@2.35	1.75@2.35	1.75@2.35	1.75@2.35	1.75@2.35	1.75@2.35
Ind. 4th Vein screenings.....	Chicago	1.85@2.00	1.85@2.00	1.85@2.00	1.85@2.00	1.85@2.00	1.85@2.00
Ind. 5th Vein lump.....	Chicago	2.25@2.75	2.25@2.75	2.25@2.75	2.25@2.75	2.25@2.75	2.25@2.75
Ind. 5th Vein mine-run.....	Chicago	1.40@2.10	1.50@2.10	1.50@2.10	1.50@2.10	1.50@2.10	1.50@2.10
Ind. 5th Vein screenings.....	Chicago	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Mount Olive lump.....	St. Louis	2.50	2.50	2.50	2.50	2.50	2.50
Mount Olive mine-run.....	St. Louis	2.25	2.25	2.25	2.25	2.25	2.25
Mount Olive screenings.....	St. Louis	1.50	1.50	1.60	1.60	1.60	1.60
Standard lump.....	St. Louis	2.35	2.35	2.35	2.35	2.35	2.35
Standard mine-run.....	St. Louis	1.75	1.75	1.75	1.75	1.75	1.75
Standard screenings.....	St. Louis	1.40	1.50	1.50	1.45	1.45	1.40
West Ky. block.....	Louisville	1.60@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
West Ky. mine-run.....	Louisville	1.00@1.50	1.15@1.50	1.15@1.50	1.15@1.50	1.15@1.50	1.15@1.50
West Ky. screenings.....	Louisville	1.00@1.10	1.15@1.30	1.15@1.30	1.25@1.35	1.25@1.35	1.25@1.35
West Ky. block.....	Chicago	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
West Ky. mine-run.....	Chicago	1.15@1.35	1.10@1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
West Ky. screenings.....	Chicago	1.10@1.35	1.10@1.35	1.10@1.35	1.10@1.35	1.10@1.35	1.10@1.35
SOUTH AND SOUTHWEST							
Big Seam lump.....	Birmingham	\$2.00@2.25	\$2.00@2.25	\$2.00@2.25	\$1.75	\$1.75	
Big Seam mine-run.....	Birmingham	1.40@1.75	1.40@1.75	1.40@1.75	1.40@1.75	1.40@1.75	
Big Seam (washed).....	Birmingham	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	
S. E. Ky. block.....	Chicago	2.00@2.75	2.00@2.75	2.00@2.75	2.00@2.75	2.00@2.75	
S. E. Ky. mine-run.....	Chicago	1.35@1.75	1.35@1.75	1.35@1.75	1.35@1.75	1.35@1.75	
S. E. Ky. block.....	Louisville	2.00@2.50	2.00@2.50	2.00@2.50	1.85@2.50	1.85@2.50	
S. E. Ky. mine-run.....	Louisville	1.35@1.75	1.35@1.75	1.35@1.75	1.35@1.75	1.35@1.75	
S. E. Ky. screenings.....	Louisville	.50@1.00	.50@1.00	.50@1.00	.80@1.25	.80@1.25	
S. E. Ky. block.....	Cincinnati	1.75@2.75	1.85@2.50	2.00@2.50	2.00@2.50	1.75@2.50	
S. E. Ky. mine-run.....	Cincinnati	1.15@1.75	1.25@1.75	1.25@1.75	1.25@1.75	1.35@1.75	
S. E. Ky. screenings.....	Cincinnati	.50@1.00	.65@1.10	.75@1.10	.65@1.25	1.10@1.25	
Kansas Shaft lump.....	Kansas City	4.50@4.75	4.50@4.75	4.50@4.75	4.50@4.75	4.50@4.75	
Kansas Strip lump.....	Kansas City	3.50@4.00	3.50@4.00	3.50@4.00	3.50@4.00	3.50@4.00	
Kansas mine-run.....	Kansas City	3.00	3.00	3.00	3.00	3.00	
Kansas screenings.....	Kansas City	2.00@2.25	2.25	2.00@2.25	2.35@2.50	2.50	

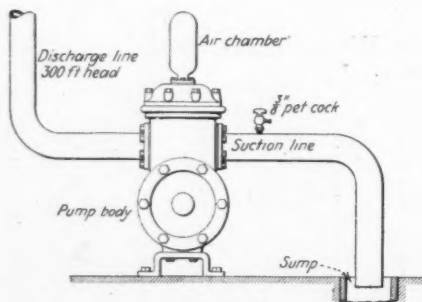
OPERATING IDEAS from Production, Electrical and Mechanical Men

Efficiency of Plunger Pump Increased By Simple Valve in Suction Line

AIR CHAMBERS of plunger-type pumps acting against heavy heads are likely to become waterlogged, with the result that the pump will hammer and labor unduly because the cushioning effect on the air chamber is destroyed. As a consequence gaskets are forced out or broken, gears stripped or the armature of the drive motor burned out.

Up until two years ago the Knox Consolidated Coal Co., Vincennes, Ind., was spending a small fortune for upkeep and repairs to pumps, according to Thomas James, superintendent of mine No. 3. Hearing of a scheme guaranteed to end the trouble, the company tried it out, it worked, and now worries from this source have been entirely eliminated. Incidentally there has been a considerable saving.

The accompanying sketch illustrates



This Hook-Up Will Save Money

the simplicity of the scheme. Into the suction line—as close to the pump as possible—is tapped a $\frac{3}{8}$ -in. pet cock or any valve of equivalent size. That'll all there is to it.

When the pump is running and the valve is open a quantity of air is introduced into the line sufficient to replace the air robbed from the air chamber. While the pump is being started, of course, this valve is closed. It is gradually opened to the point where the pump operates to best advantage. At the correct point of adjustment water will squirt out of the valve. If the valve is opened too wide the pump will stop. How far the valve should be opened depends upon the size of the discharge line

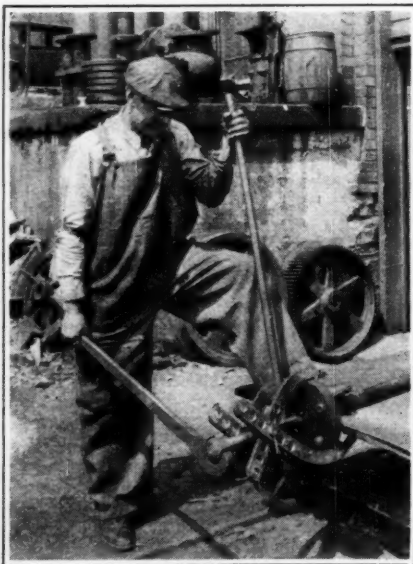
and the size and speed of the pump—also the head.

If you have a pump equipped with a 20-hp. motor, which labors as it runs, just add the valve as described and substitute a 10-hp. motor. You will find that the revamped installation is much more satisfactory.

Adjustable Pinion Puller Stands Heavy Duty

A puller for the removal of pinions, gears, pulleys or couplings from shafts which is readily adjusted for a wide range of sizes has been developed in the Windber (Pa.) shops of the Berwind-White Coal Mining Co. As illustrated by the accompanying photograph, the device consists of a pair of claw toggles mounted on shafts integral with and projecting from a block nut, through which a heavy screw is fed. When the screw is turned through the nut block it thrusts against the shaft while the toggle claws hold the piece being removed. This puller has withstood the strain set up by the application of a

This Puller Removes It



36-in. long wrench on the head of the screw.

The screw is made of tough steel such as is used for armature shafts, being heat-treated and hardened at the end. Its diameter is $1\frac{3}{8}$ in. and it is $12\frac{3}{4}$ in. long, with a hex head $1\frac{1}{2}$ in. thick and $2\frac{1}{8}$ in. across. The block nut is $2\frac{1}{2}$ in. square and 2 in. thick and the integral shafts projecting from it are $1\frac{1}{2}$ in. long and turned to a diameter of 1 in. The toggle claws are made of bar steel, $\frac{1}{2}$ in. thick, 2 in. wide and 16 in. long when shaped as shown. For adjusting the puller to the diameter of the piece to be removed from a shaft, each toggle arm is provided with six $1\frac{1}{4}$ -in. holes on $1\frac{1}{2}$ -in. centers.

Large Lamps Impractical With Low Mine Roof

Recently the superintendent of a mine told of his plan to purchase a number of headlights fitted with "non-glare" lenses and use them in the mine for permanent lighting of haulways. He expected to install the lamps close to the rib and point the beam about parallel to the track. He hoped thus to obtain good illumination with comparatively few lamps.

He asked for comments on his plan and was told promptly that it is impractical because if there is such a thing as a non-glare headlight it is one that emits such a low intensity as to be almost useless in a mine. It is contrary to all reason that a strong beam of light can be projected through darkness or through much weaker light without glaring in the eyes of anyone who has his face in the beam and is looking toward the light.

The only way to prevent glare when projecting a beam of high intensity is to confine the beam below the eyes of anyone approaching the light. Because the

eyes of a man operating a mine locomotive are but 2½ to 4 ft. above the track it would be practically impossible to confine the beam below his eyes and yet illuminate the track for as much as 100 ft. or more.

Due to natural limitations, such as lack of height and uncertain roof, mine lighting methods have improved little or none since the first installations. Small units of low intrinsic brilliancy placed close together afford the best illumination. But the brilliancy of lamps has been increased since the days of the carbon lamp, thus introducing another difficulty.

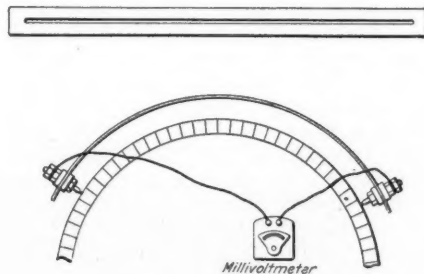
If the lamps are to be shaded so as to confine the light within an angle preventing glare from either direction, the spacing should not exceed the height by more than 50 per cent.

Tool Spaces Armature Testing Points

When wave-wound d.-c. armatures are tested for short circuits, open circuits, and so on, it is difficult to locate the correct segments each time and to maintain the proper pitch.

W. E. Warner, of Brentford, England, describes a home-made device which facilitates such testing. It is made from a springy piece of bamboo 1 in. wide by ½ in. thick cut 12 in. long or such other length as will fit the size of commutator.

Holes ⅛ in. in diameter are drilled 1 in. from each end. The wood is then cut out between holes, making a slot ⅛ in. wide through the center of the strip. The bamboo is then formed



Slotted Strip and Tester in Use

to the approximate curvature of the commutator by tying under tension in a vise and leaving in this position for several days. The strip is then given a coat of insulating varnish.

The contact points, made from ⅛-in. brass rod, are fitted with nuts and large washers so that they can be moved to any position along the slot, and clamped. Once the correct spacing is determined testing proceeds without difficulty in keeping the instrument connections to correct pitch.

Automatic Switching Equipment Furnishes Reliable Substation Control

SEVEN years of service in the industry have demonstrated that automatic switching equipment furnishes the most reliable, economical and satisfactory means for controlling mining substations, says H. S. Littlewood, Westinghouse Electric Mfg. Co. Mine operators' confidence in automatic control has increased until manual operation is considered only in a few special applications. Equipment is described herein which represents the

ing of the disconnecting switches and the hand-operated oil circuit-breaker. This circuit may be energized continuously, if desired, since the motor and auto-transformer are disconnected from the line by the starting and running contactors. Starting is initiated by closing the push button on the switchboard, or, if control is from a remote point, the master-element push button (1) forms the function of the push button mounted on the switchboard. After being started, the station will run automatically until one of the push buttons is opened. The method of operation is as follows:

The incoming line oil circuit-breaker (52), the emergency circuit-breaker (71), and the disconnecting switches are now closed. The motor generator will start when the starting operation is initiated by the operation of the master-element push button (1). As the push button is closed, the master relay (3) closes, provided the incoming line is energized with a 3-phase symmetrical voltage and that none of the protective devices that short-circuit or open-circuit the operating coil of this relay have operated.

When relay (3) closes, one of its contacts completes the circuit for the master contactor (4) from bus A to bus B. When relay (4) closes, it connects the A and A-1 buses, thus energizing the A-1 bus.

As bus A-1 is energized, the circuit is completed to the operating coil of the magnetizing contactor (6C) which, upon closing it, connects the auto-transformer to the incoming alternating-current circuit. The closing of contactor (6C) is closely followed by the closing of the starting contactor

MONEY For Practical Ideas —And How!

\$5 AND MORE paid for ideas that will help some other coal man to be more efficient.

Mining methods, haulage, ventilation, preparation, safety—these and other activities offer you an opportunity to earn cash.

latest design in automatic switching for synchronous motor-generator sets in mining service.

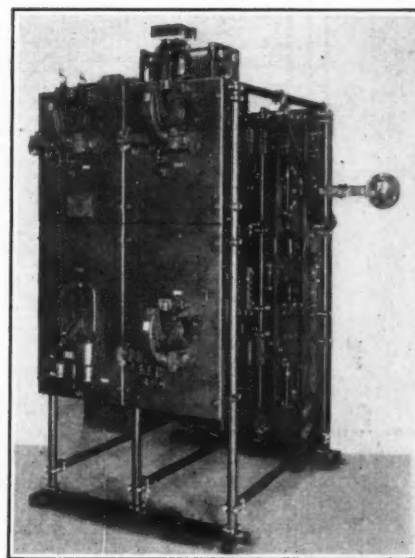
This equipment is fully automatic after the remote or panel-mounted push button has been operated. The switching operations involved are controlled through relays by system and machine conditions. The direct-current feeder equipment is of the automatic service-restoring contactor type.

In the schematic diagram—p. 256—the main structure on the left represents the power leads and large equipment, and the skeleton structure at the right is that of the control. The long horizontal lines on the control portion represent control buses, and when all contacts in the circuit are closed the coil or device is energized. The legend gives the meaning of the various symbols. Each relay, contactor and operating device that has a function to perform is identified by a number.

In the description of operation the term "make" contact means a contact that closes when the device of which it is a part is actuated. The term "break" contact means a contact which opens when the device of which it is a part is actuated.

In starting the main alternating-current circuit is energized by the clos-

Starting and Running Panels



(6) which, upon closing, connects the synchronous motor to the incoming line through the auto-transformer, thus causing the motor to rotate on reduced voltage.

The magnetizing and starting contactors are held energized in the closed position during the starting period, or until the synchronous motor is running at synchronous speed.

As the motor generator is being brought up to speed, the synchronous-motor field is connected through the field rheostat and alternating-current machine field relay (40) to the armature of the direct-current generator. As the speed of the motor-generator increases, the voltage of the direct-current generator builds up. When it becomes approximately 75 per cent of normal, the alternating-current machine field relay (40) will close.

With the building up of the generator voltage, the transition relay (19) closes, and a "break" interlock (19) in the operating coil circuit of the magnetizing and starting contactors (6C) and (6) is opened. This operation de-energizes these contactors.

As the magnetizing contactor (6C) and the starting contactor (6) reach their open position, one of the "break" interlocks of each of these contactors completes the circuit to the operating coil of the running contactor (42). Transition relay (19) previously closed its interlock in this circuit.

The running contactor then closes and is held energized in the closed position. The synchronous motor is now connected to the alternating-current line at full voltage.

Interlocks of the master contactor (4), the running contactor (42) and the field failure relay (40) are now closed, and the circuit is complete to the compensating coil (82A) of the reclosing timing relay (82). After a short time the reclosing relay will close to "make" contacts (82A) in the circuit of (84).

The circuit of the generator relay (84) is now complete and upon closing the "make" contact of this relay establishes the circuit through the bridging resistors (RB) and (RF). A "make" interlock of relay (84) establishes the circuit of the resistance

measuring coil (82B) of the reclosing timing relay (82).

If the resistance of the feeder or load circuit is high enough to prevent the generator from picking up an excessive load, the reclosing timing relay (82) will close its "make" contact (82B) in the circuit of the closing coil of the direct-current line contactor (72).

Before closing the line contactor (72), the voltage directional relay (91) determines whether the machine voltage is higher or lower than the feeder voltage (voltage from some other source). Provided the machine voltage is higher than the feeder voltage, relay (91) will close its contacts and energize the closing coil of the direct-current line contactor (72).

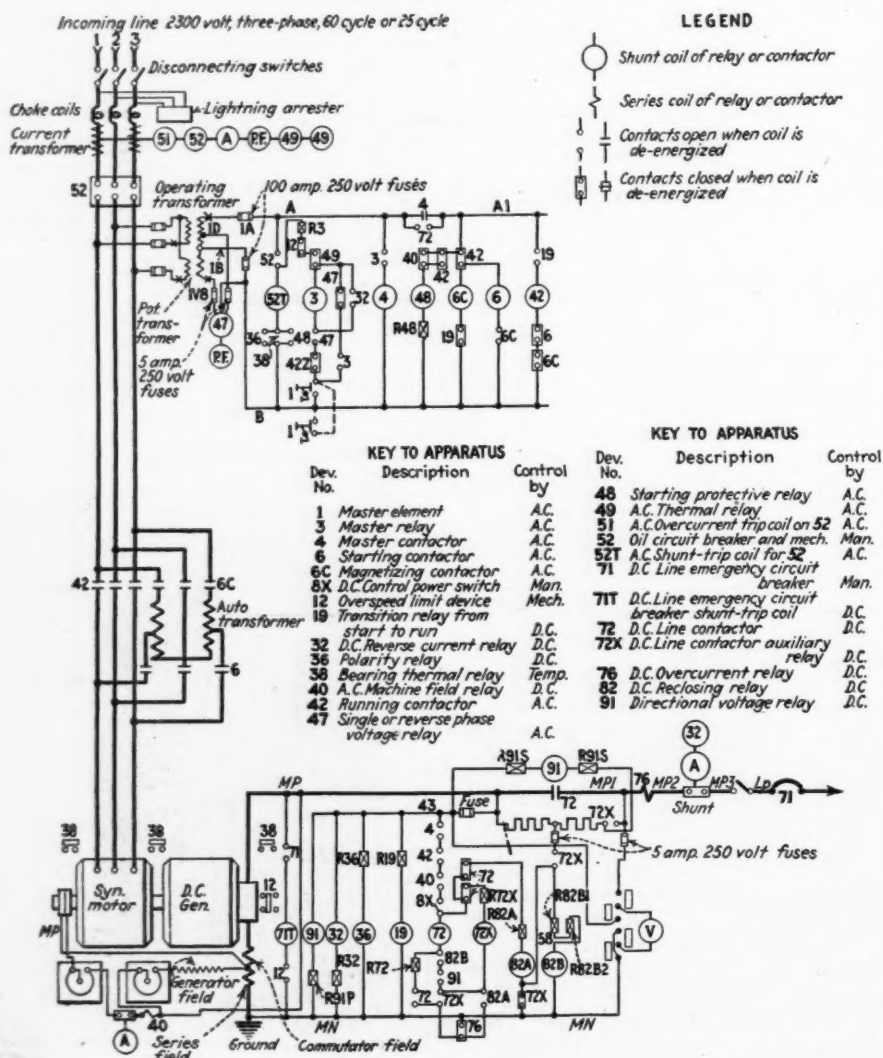
The circuit now being complete, the direct-current line contactor (72) will close. The closing of this contactor connects the generator to the main bus or load circuit. The motor generator now takes its share of the system load, and continues in operation until shut down by the operation of the master element push button (1) or one of the protective devices.

The unit is normally shut down by the operation of the master element push button (1). The shutting down operation is as follows:

Upon the operation of the master-element push button, the master relay (3) opens. This operation de-energizes the master contactor (4), which upon opening causes the direct-current line contactor (72) to be de-energized.

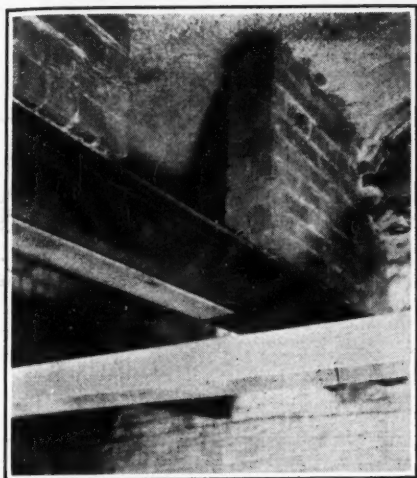
The direct-current line contactor, upon opening, causes the "make" interlock (72) bridging the contact (4) in the alternating-current control-bus circuit to be opened, thus de-energizing the running contactor (42). It will be noted that the motor generator is first disconnected from the direct-current circuit and then from the alternating-current circuit. The interlocking of the scheme provides that this will always be true, even under conditions of abnormal shutdown. This prevents any possibility of the alternating-current circuit from being disconnected before the direct-current circuit.

Schematic Diagram of Complete Substation Unit



Brick and Steel Support High Spots in Roof

Many are the ways of supporting high roof over a roadway but none is more substantial or cleaner cut than the method illustrated in the accompanying photograph, used in the No. 2 mine of the Bell & Zoller Coal & Mining Co., at Zeigler, Ill. In this instance a heavy I-beam rests on brick sidewalls and on the beam are two roof abutments, also of brick. The supporting walls over the beam are not built as one for the



Supporting High Roof

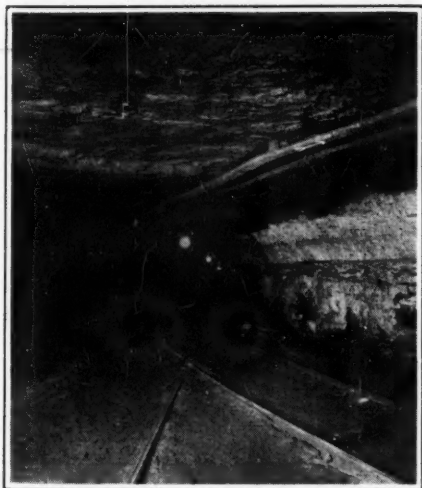
reason that a roof pocket would then be formed in which gas might accumulate.

Trolley Guard Boards Rigid If Set Flat

In a group of eastern Kentucky mines, as is largely the practice elsewhere, wooden boards are utilized as trolley-wire guards; but at these mines the boards are set flat instead of vertical. The result is the guards are more rigid and require less frequent repairs. Furthermore, the guards are more quickly erected.

It might be argued that this practice is dangerous in mines working high-volatile coals since it provides shelves upon which coal dust might accumulate. Why not increase the width of these boards and place upon them a quantity of rock dust? Thus would be provided a number of barriers located at junctions, than which no other location is more strategic.

They Stay in Place



Trend Toward High-Voltage Starting to 50 Hp. With Compensators Still Used

PRESENT tendencies in starting a.c. motors are indicated in the following paragraphs quoted from a paper, "Methods of Starting Squirrel Cage Induction Motors and Synchronous Motors for General Applications," by C. W. Falls, industrial engineering department, General Electric Co., presented before the Lehigh Valley Section of the American Institute of Electrical Engineers, Bethlehem, Pa., Jan. 21.

"One point in connection with compensator operation which has been very much overemphasized is the possibility of a transient current of a high value being obtained on throwing from starting to running when, in the ordinary compensator, the motor is momentarily disconnected from the line. It is possible to find such a transient if you happen to hit a certain point of the voltage wave upon reconnecting, and have an oscillograph to catch it. From a practical point of view such a current, lasting for only a few cycles at most, can have no observable effect on the system or motor until large motors are involved, say 200 or 300 hp. In such larger sizes the effect may warrant special connections in the starter to avoid disconnecting from the line.

"Obviously if this feature did not affect the small-capacity power systems of years gone by, it is ridiculous to think of it as possibly harmful with the much larger systems of the present day.

"As a device for obtaining the least disturbance, for frequent starting, long starting periods and general applicability when squirrel-cage motors are suitably applied, the compensator cannot be equalled as a one-step starter.

"While power-company starting-current rules have in general not been materially changed in the last 12 to 15 years, and therefore users with one or

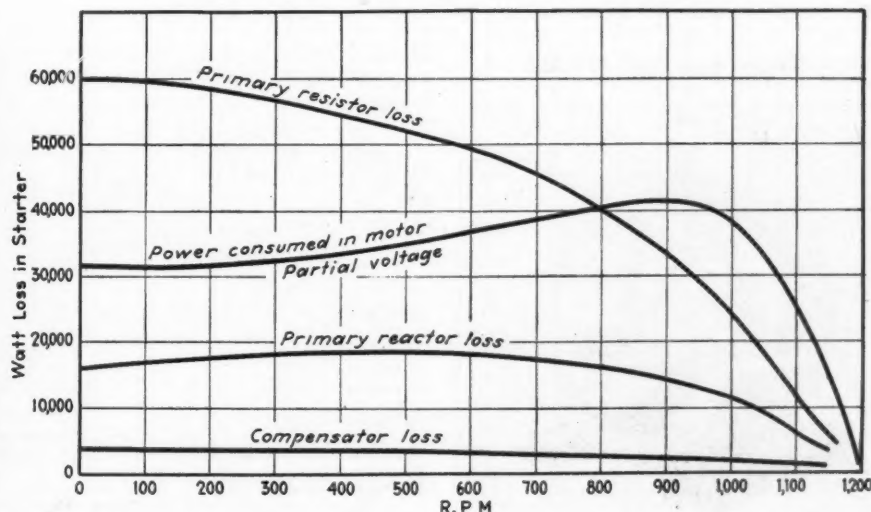
two motors have been forced to retain current-reducing starters, the number of consumers with large connected loads has multiplied rapidly. In the plants of such consumers full-voltage starting can be and is practiced with large motors. To this increasing number may be added a large number of plants producing their own power on a large scale. So the practice of full-voltage starting of squirrel-cage motors is well established and increasing."

After referring to certain curves showing the watt rate of consumption of a motor and of three partial-voltage type of starters during acceleration of the motor the author says: "It will be seen that the compensator consumes at the lowest rate, the reactor comes next, while the resistor starter consumes at the greatest rate of all. These curves represent the most important differences between these types of starters. . . . The watt rate loss for the resistor was some fifteen times that of the compensator." And in describing the reactor method of starting he states: "Judging from the data just mentioned for a 25-hp. 440-volt motor, the heating may easily be four times that of a compensator."

"To summarize the situation of methods of starting squirrel-cage induction and synchronous motors as it appears today, the trend seems toward a more general use of full-voltage starting of motors up to 30 hp. and probably up to 50 hp., through proper utilization of high-reactance squirrel-cage motors having low or normal starting torque and low starting current.

"For general industrial use the compensator still should be the most generally used device where low starting current, reliability, low first cost, capacity for repeated starts and space are

Loss During Acceleration With Four Kinds of Starters



factors of importance. The resistor starter should find a limited field where the gradual application of torque and current are important. The reactance starter does not appear to have a very great field of application except in large motors where the starting duty is light.

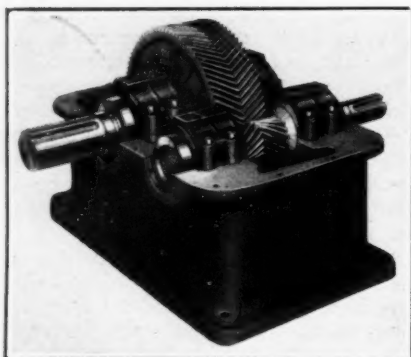
"If the distribution system can stand

the high current required by a reactance starter, it would seem that, for a general-purpose motor application, more effective results as to first cost, reliability and simplicity could be obtained by the use of full-voltage starting of motors designed for the particular service."

Status of Worm Gear Changed By Recent Developments

APLICATION and efficiency comparisons of the four general types of speed reducers—spur, herringbone, commercial worm and special worm—are set forth in an article by F. A. Emmons, of the Foote Bros. Gear & Machine Co., in a recent issue of *Power Transmission*.

"Briefly, the advantages of a herring-

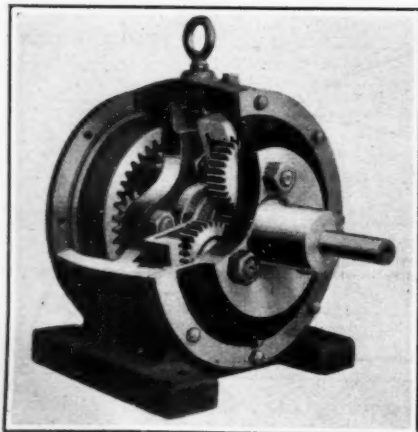


Single Herringbone Reducer

bone gear reducer as compared to the spur gear reducer are as follows:

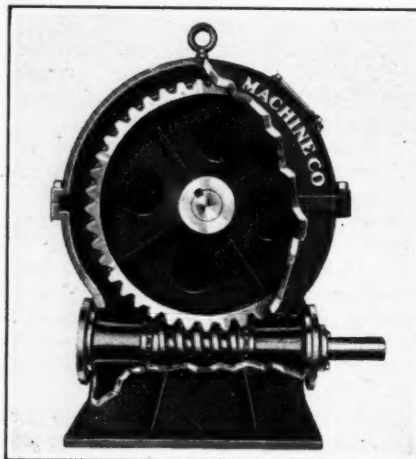
- "(1) It will handle high initial speeds.
- "(2) It will stand shock loads better on account of its tooth construction.
- "(3) It will give a smoother transfer of power from one gear to another.
- "(4) It can be used for speed-increasing purposes at lower reduction ratios.
- "(5) Generally, a herringbone gear reducer will carry a certain amount of

Typical Spur Gear Reducer



overhung load on the extended shafts without the addition of an outboard bearing, but this load should not be greater than recommended by the manufacturers.

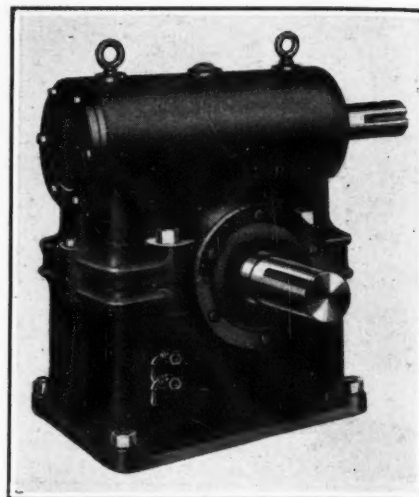
"Worm gear speed reducers and their principles of operation have been known for a long time, but it was not until recently that this type of reducer received the attention that brings about constructive development. The worm gear type of reducer has been and still is considered by many as an inefficient and unreliable means of speed reduc-



Ordinary Type Worm Gear Reducer

tion, but recent investigations have brought about improvements in design and manufacturing methods that have resulted in the development of distinctly modern and effective worm gear reducers to meet the exacting conditions of modern industrial service.

"These developments have brought



High Efficiency Worm Gear Reducer

the modern worm gear reducer into a class of high speed, high efficiency and high power transmitting capacity, yet the simple compact construction is retained, making it an ideal drive where space is limited and where the power has to be transmitted at right angles. The efficiency of this type is almost on a par with any other type of reduction unit, and at certain low ratios the efficiency is even greater than the spur and the bevel gear reducers. Due to the simplicity of design and its adaptability to any kind of position and installation, the high-efficiency worm gear reducer has found a wide popularity."

Further on in the paper the question of efficiency of a locking worm gear is discussed. "The public is often confused as to the self-locking ability of worm gears. Several conditions influence this feature, principally the lead angle of the worm thread. On a plain-bearing worm gear reducer it is safe to assume self-locking when this angle is 6 deg. or less. This angle will give about 50 per cent efficiency and in order for a worm gear to lock the efficiency must be 50 per cent less."

The accompanying table is a compact summary of qualifications of the four types of gears. Numbers indicate the comparative values from the different standpoints; 1 indicates "best," and successive higher numbers indicate successive lower gradings.

GENERAL SELECTION DATA FOR SPEED REDUCERS

	Spur	Herringbone	Commercial worm	Special worm
Approximate efficiency.....	2	1	4	2
Overload capacity.....	1a	1a	1a	1a
Quietness.....	3	2	2	1
High speeds.....	3	1	2	1
Ratios, up to.....	400 to 1	300 to 1	100 to 1	2500 to 1
Direction of drive.....	Straight line	Parallel offset	Right angle	Right angle
Vibration.....	3	2	2	1
Life.....	1	1	3	1
Initial cost.....	2	3	1	4
Ability to carry over-hung loads without outboard bearings.....	4d	5e	6f	5e
Ability to carry shock loads, overloads and reversals.....	2	1	2	1
Space required.....	2	3	2	1
Continuous service.....	2	1	3	1

a 100 per cent momentary. b 25 per cent continuous. c 25 per cent continuous with conveyor worm gear. d No. e Reasonable. f Small.

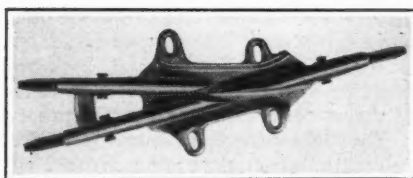
WHAT'S NEW



in Coal-Mining Equipment

Old Dream Comes True: Ductile Weld Metal

Heretofore metal deposited by electric arc welding has partaken of the characteristics of cast steel. By a new process, known as the "electronic tornado," now developed to a commercially applicable stage by the Lincoln Electric Co., Cleveland, Ohio, the metal deposited in the weld is given physical characteristics equal to or better than the metal of the plates joined by welding. This result is accomplished by the purifying effect of the electronic tornado.



Sidetracks Bumps

permitting the wheel to follow more closely the direction of the locomotive on the curve.

Drag of the wheel against the wire, angle wear on both wire and wheel and unnecessary stress on the trolley base are minimized. The longer runners of the frog also keep the wheel on a natural track instead of bumping along in a manner to cut the pan of the frog and mushroom the flanges of the wheel. This frog is equipped with a bronze renewable cam tip. By correct placement it will take care of practically all kinds of trolley turnouts. It is made right and left hand in sizes to fit 3-4, 4-0, and 6-0 round and grooved wires and 4-0 Fig. 8 wire.



Twisted After Welding

Not only are the welds produced by this process uniform in structure and ductility but it is said the cost of welding is but a fraction of the cost by present-day methods. The application of this discovery at this stage is more toward automatic than manual welding, upon which it will have no immediate affect.

Frog for Hard Service Eliminates Bumping

A "hard service" frog is the description the Ohio Brass Co., Mansfield, Ohio, gives its new patented MBC trolley frog intended for use in mine work. This frog is said to reduce wear, tear and strain on overhead wire, trolley wheel, trolley base and the frog itself, for its design is such that it may be placed nearer to the switch point, thus

New Calculator Reveals Coal Heat Unit Cost

A new form of slide rule known as the "Fuel Value Computer" has been developed by the Coal Specialties Co., 50 Church Street, New York City. This device is arranged to make easy the calculation of the cost of fuel per million available B.t.u. when delivered cost, ash content and calorific power are known. Based on the best of present-

day combustion engineering practice, the scales are so calculated that the fixed charges which must be made against any given coal, due to its ash content, are automatically taken care of in one setting of the scale.

Reference to the illustration will show the construction of the rule. Scale A is plotted around a series of curves printed on a sheet of flexible material on which is mounted a semicircular rider carrying scales for ash and B.t.u. content. In use, the delivered cost per net ton of coal is set on scale A against the ash content on scale B. Opposite the calorific power on scale C may be read the cost per million available B.t.u. By means of the computer the actual cost of different fuels may be quickly obtained. An example of the use of the computer is as follows: A certain coal is delivered at \$5.75 per ton; it contains 5 per cent ash, and the calorific power is 14,000 B.t.u. The illustration shows this particular set-up and it is apparent that the cost per million B.t.u. is 21c.

The back of the computer carries tables for conversion of cost on a gross-ton basis to that on a 2,000-lb. basis. The computer thus contains in itself all that is necessary to make any coal comparison. The data are said to have been so utilized that the results apply equally well for any type of boiler firing.

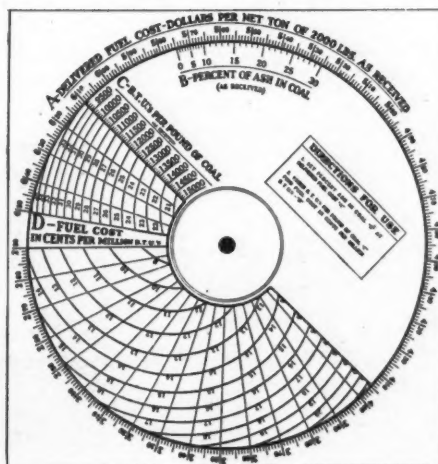
Drop-Door Air-Dump Car Suited for Stripping

A new dump car of the drop-door type designed to meet the demand for low height cars in 25- and 30-cu.yd. capacities to facilitate loading in strip mining and similar work has been added to the line of the Western Wheeled Scraper Co., Aurora, Ill.

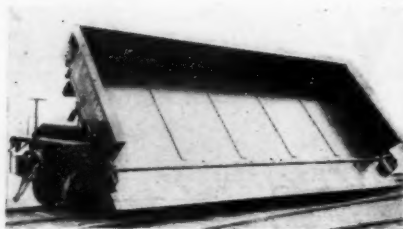
The car has exceptional strength and is built without locks. The cross sills of the body rest directly on the under-frame draft sills. The body also is supported on twelve pivots, six on each side of the car. The bed is inherently stable and cannot be tipped, the manufacturer asserts, unless air is admitted to the cylinders or some external force applied to the bed. The need for all locking mechanism is therefore eliminated and there is no possibility of accidents due to careless handling.

The use of dual pivots on either side of the center line of the car, about which the loaded bed rotates while dumping, results in a remarkably fast dumping car with relatively small air consump-

Handy Fuel-Cost Finder



What's NEW in Coal-Mining Equipment



Discharges Neatly and Quickly

tion. Single-stroke cylinders operating at low air pressure raise the bed to a dumping angle of fully 50 deg., and near the end of their stroke an auxiliary link mechanism exerts a short, quick throw that cleans the bed quickly and thoroughly. The bed returns to its normal position automatically as the air is exhausted from the cylinders.

The side or door is of the down turning type which rotates as the bed is tilted until it reaches a position parallel to the floor with its outer edge 7 ft. from the center line of the track. The door is extremely strong and rigid and the controlling mechanisms are at the ends, enclosed and protected. The mechanism is of the "floating" type, so designed that no damage can result from the door striking a boulder or other obstruction while dumping, as the door will ride on the obstruction while the bed is raised to its full dumped position.

The car has exceptionally few moving parts and is built to withstand hard service and even abuse with low maintenance costs. The car is provided with Dalman trucks.

More Comfort for Wearer Of Electric Cap Lamp

The battery of an electric cap lamp is annoying to the wearer if it is suspended from an ordinary belt. Usually the battery hangs rather loosely and "flops" about to a considerable degree. A belt of substantial proportion which holds the battery firmly in place, distributing the weight over the entire periphery of the waist, and at the same time supports the back of the wearer is being marketed by Howells Mining Drill Co., Plymouth, Pa.

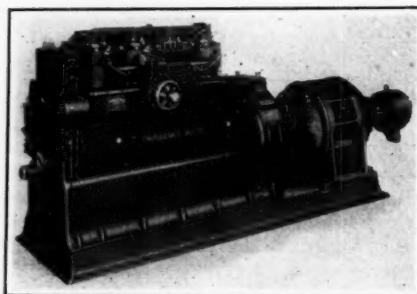
Keeps Battery in Place



Small Diesel Engine Fills Sudden Need

A line of Diesel engines rated from 30 to 180 hp. which serve the same purpose as gasoline engines has been developed by Fairbanks, Morse & Co. The largest of these engines can be installed for standby service, as for driving a mine fan when the main source of power is interrupted. They are of the two-cycle, airless injection and high-compression type. The unit may, of course, be direct-connected to an a.c. generator.

The lubricating system is entirely automatic, every part being treated with



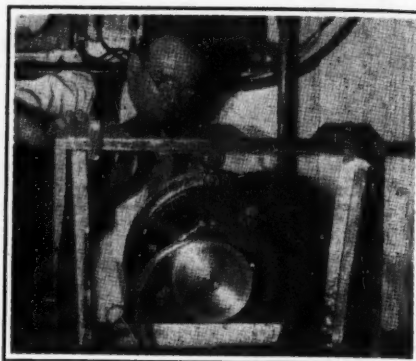
Provides Standby Source of Power

oil forced under pressure by a pump or mechanical lubricator. This engine will burn fuel of low grade and it is said that total operating cost will seldom exceed 1½c. per kilowatt-hour.

Lubrication of Bearings Put to Test

How much oil can a ring deliver? What is the best shape of its section? Why does oil occasionally leak out from bearings that apparently are perfect? These are a few of the problems studied by lubrication experts of the Westinghouse Electric & Mfg. Co. The photograph shows G. B. Karelitz, research engineer, conducting a test on the main part of a 7-in. bearing.

The oil is supplied by an oil ring which drags along oil from the well to the journal. The ring itself is driven by the journal on which it rides. This test reveals the fact that the ring never



Tests Ring Oiling of 7-in. Bearing

touches the journal but rides on oil. If an electric light is put across the journal the ring does not burn because the oil between the two metal surfaces acts as an insulator.

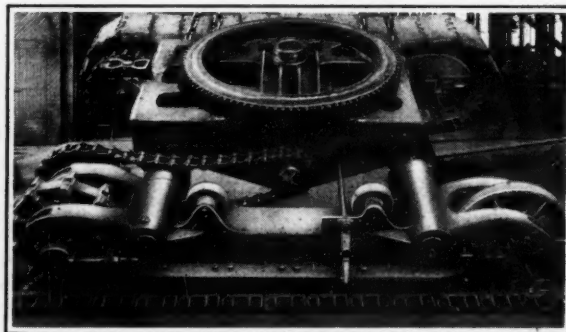
Westinghouse experts study many types of bearings varying in size from the tiny instrument bearings to massive bearings of 32-in. diameter.

Single-Shaft Drive Shovel Is Non-Clogging

A so-called single-shaft-drive caterpillar-type mounting for shovels and cranes has been developed by the Bucyrus-Erie Co. This drive is non-clogging, even when it is shoveled full of dirt, according to the manufacturers. The drive chains, of hardened forged steel, are self-cleaning. The mounting easily takes grades of 30 per cent and steeper. A two-way brake, which operates with a ratchet effect, allows free movement in either direction as desired, but locks the machine against the digging or on a grade. Sharp turns can readily be made.

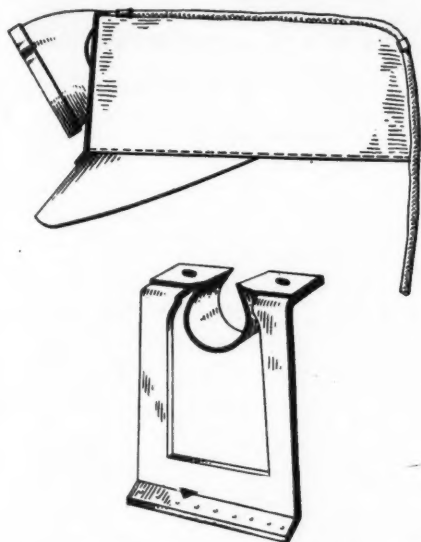
All parts are accessible and any wearing parts can be removed without disturbing the others. The one gear and its pinion are inclosed and operate high above the ground, with 12-in. clearance. The truck frame is practically indestructible, being a one-piece annealed steel casting 23 in. deep. All treads have 1½-in. hardened steel pins. All of the company's gas-air and B-2 steam machines are being furnished with this mounting as standard equipment.

Single-Shaft Drive Caterpillar-Type Mounting for Shovels and Cranes



On This Miner's Cap Lamp Fits Better

A miner's cap specially designed to carry various types of electric cap lamps in a position giving greatest illumination, efficiency and more comfort to the wearer is offered by the Penn Mfg. & Supply Co., of Wilkes-Barre, Pa.



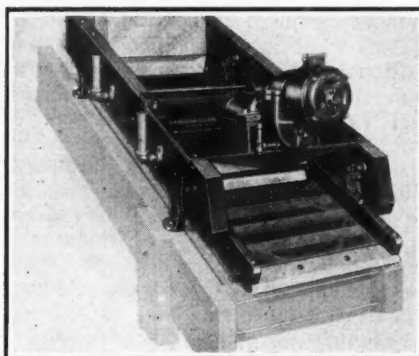
Miner Sees More When Thus Equipped

Riveted to the visor of the cap is a holder with a U-shaped recess which receives the body of the lamp or head-piece proper. By this arrangement the lamp sets closer to the head (lower and further back), thus minimizing the leverage effect and resulting in a corresponding increase of comfort to the wearer. Since the lamp sets back over the head, the length of the visor may be reduced. It is said that this cap provides wider and clearer visibility. It has been developed by Charles W. Watkins, of Kingston, Pa., and is covered by patent applications.

James Vibrating Screen For Coal Sizing

The James screen, a recent development which is definitely applicable to the preparation of anthracite and bituminous coal, is being marketed by the Norwood Engineering Co., Florence, Mass. It incorporates a new vibration mechanism involving only three moving parts. A gyrating ram operates against a heavy piston which transmits the impact through a small anvil to a wooden crosspiece fastened to the hanger bars carrying the screen frame. In the ram, which gyrates at 300 r.p.m., are six chilled-steel sockets. As each of these collide with contact points on the piston, the frequency of impact per minute on the screen bed is 1,800.

The vibration is transmitted uni-



Efficient Screening Without Blinding

formly over the entire screen area and the characteristics of the vibratory motion are such that the screens will not blind.

Replacement of the entire screen surface due to wear of any part is unnecessary as the screen is sectional in units of 6 sq.ft. Under actual working conditions a screen unit or jacket may be replaced in less than 2 minutes.

The screen may be operated either by a 1-hp. motor or from a line shaft. A motor of this size is successfully operating a screen of this type 18 ft. in length and whether the screen be large or small the one motor imparts uniform vibration over the entire surface.

This screen is said to have an exceptionally wide sizing range, and is made in two types, for handling either wet or dry material. It was developed by U. S. James, mechanical and metallurgical engineer, of Newark, N. J.

Equip Belt Carrier for Any Type Bearing

During 1927 belt carriers for Jeffrey belt conveyors were standardized so that the same stands and bases could be used with any one of the three types of pulleys—the plain bearing, the bronze bushed and the roller bearing. These gray iron pulleys are made with open ends; in place of solid ends to insure rigidity of the walls, three arms join the hub and roll. Between the arms six ribs provide additional lengthwise rigidity. The free carbon in the gray iron acts as a rust repellent; such pulleys resist corrosion much better than steel pulleys, especially on wet jobs.

Pulleys with plain or bronze bushed bearings have hubs specially cored out

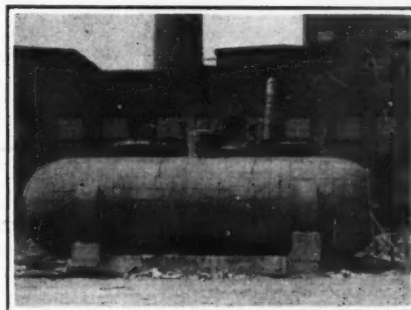
to form large recessed grease pockets connecting with the Alemite pressure lubrication fittings at the end of the hollow shaft. These grease pockets are very useful on long belt conveyors where a few pulleys often are skipped over or neglected at the regular oiling. The reserve supply of grease will last until the next oiling where an ordinary pulley would run dry, stick, wear flat and eventually ruin the belt.

Plain-bearing pulleys that are worn may be drilled out and put back into service with new bronze bushings. For belt conveyors installed to carry materials that are severe on metal bearings—coke breeze, for example—Jeffrey makes a roller-bearing pulley pressure greased, accurately fitted and five times grease-sealed.

The labyrinth construction provides five pairs of closely joined metal surfaces keeping powdery abrasives from reaching the bearings. In addition grease under pressure from the inside flows all dirt outward. Slots in each collar make possible perfect adjustment and concentric running.

Steam Accumulator Cuts Power Plant Peaks

As a flywheel is to an engine so to a boiler plant is the steam accumulator, according to the Ruths Accumulator Co., Inc., New York City. The prac-

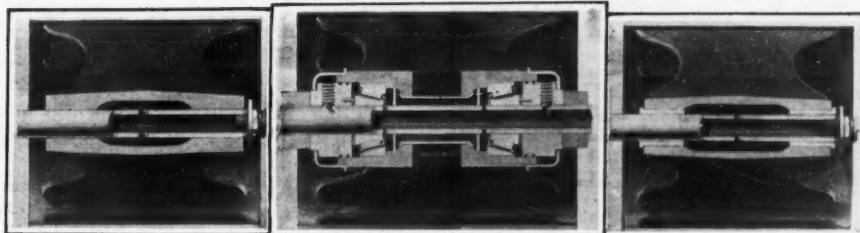


The Accumulator Set Up

ticability of this equipment has been demonstrated by 300 installations over a period of ten years in Europe.

The accumulator is based on the principle of storing in a large quantity of water, under pressure and at saturation temperature, the heat energy of steam, and releasing this energy in the form of steam under decreasing pressure. This

Conveyor Suited to Either Type of Bearing



What's NEW in Coal-Mining Equipment



Mahanoy Plane Has One

system is not merely a medium for the storage of steam; it automatically controls the accumulated supply, with the result that no lag exists between demand and supply. It is said the accumulator eliminates peak loads, maintains constant pressure, saves fuel, etc.

The accumulator consists, in the main, of a cylindrical steel tank with hemispherical ends and a number of automatic regulating valves which control the co-operation of the boilers and the steam reservoir, and at the same time govern the distribution of steam. The system may be profitably applied to boiler plants having a capacity as low as 500 hp. and under certain conditions even less.

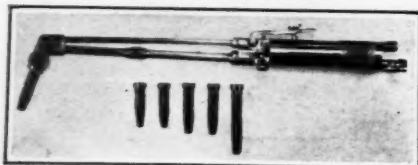
Cutting-Welding Torch Is Light but Strong

A new light-weight torch which cuts or welds with the mere interchange of tips has been developed by the Alexander Milburn Co., Baltimore, Md. It is made to operate with either oxygen and acetylene, oxygen and hydrogen or other gases.

This torch, known as type RI, obviates the necessity of using two torches, also of disconnecting hose from the torch valves when changing from cutting to welding operations or vice versa. It is extremely light in weight for the wide range of work it performs, weighing only 40 oz., and will weld the lightest or heaviest metals and cut upward of 12 in. in thickness.

The torch has only two gas tubes (made of stainless steel); the high-

Only Tips Need Be Changed

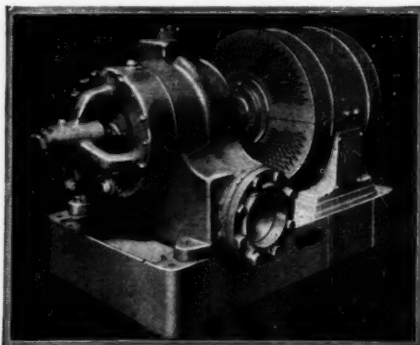


pressure cutting oxygen thumb button remains fixed in either open or closed position without sustained pressure from the thumb; the forged bronze torch head and valves have a tensile strength of 60,000 lb. per square inch. Designed for severe work and for continuous operations, it uses the heat to the best advantage while affording protection to the hands of the operator; all valves are readily accessible and the supermixing of gases results in a neutral, uniform flame as well as the elimination of flashbacks.

Centrifugal Pump Is Self-Priming

A single-stage double-suction enclosed-impeller vertical split-casing volute type centrifugal pump known as the Jennings is being marketed by the Nash Engineering Co., South Norwalk, Conn. It has a self-priming device consisting of a built-in Nash vacuum pump mounted on a shaft which is connected by a flexible coupling to the main pump shaft.

When starting, the self-priming device, or air rotor, quickly exhausts the

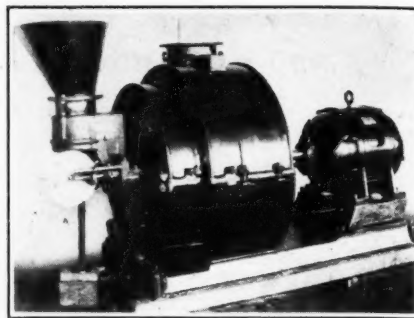


Self-Priming Centrifugal

air from the suction piping and casing, so that full rated capacity is delivered without delay. No ejectors, hand pumps, power vacuum pumps or foot valves are required. This device is supplied in standard sizes up to 1,000 gallons per minute.

Unit Fuel Pulverizer For Small Boilers

The Fuel Efficiency Engineering Corporation, of Birmingham, Ala., now offers in the Warrior unit pulverizer, equipment for the pulverization of fuel applicable to boilers as low in capacity as 125 hp. and as much higher as desired. The unit is of the impact type and consists of two chambers, in each of which the coal is acted upon by revolving paddles. The impact of these paddles upon the coal, the impact of the coal upon the steel linings of the cham-



Increases Boiler Efficiency

ber and the thrust of coal upon coal causes pulverization.

The coal passes progressively from the first to the second chamber and is therefore pulverized in two stages. As the coal is disintegrated it is carried through and from the pulverizer by air which passes around the edge of the disks carrying the paddles.

In the second chamber the velocity of the air current is lower while the speed of the paddle is greater than in the first chamber. From the second chamber the pulverized coal is carried into an air chamber, where it is thoroughly mixed with additional air, and then enters the fan. Preheated air introduced at the feed end permits the pulverizing of coals high in moisture with comparatively low consumption of power.

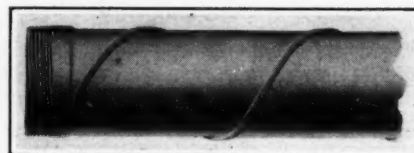
Stones for Double Duty

A new "Double Duty" commutator stone for touching up commutators and slip rings has been brought out by the Martindale Electric Co., Cleveland, Ohio. One end is of coarse (cutting) grade and the other end of fine (finishing) grade. These stones are furnished in various sizes convenient for carrying in the pocket or tool kit.

Naylor Pipe Made Acid-Resisting

The Naylor Spiral Pipe Co., Chicago, Ill., is now furnishing its spiralweld pipe in Toncan iron, which is not materially affected by rust or acids, in wrought-iron standards of 4 to 12 in. diameter and 20-ft. lengths. Welding of the spiral seam to the wall gives the pipe ample strength for high-pressure uses. The pipe is equal in strength to wrought-iron pipe, yet weighs only half as much.

Replaces Wrought-Iron Pipe

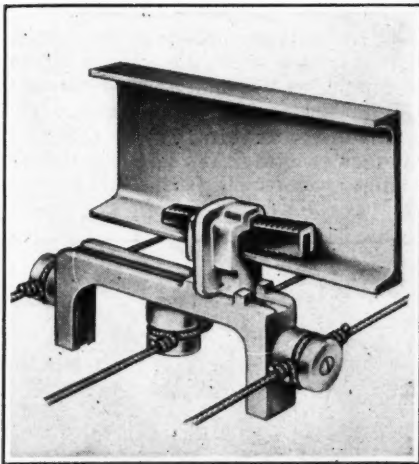


What's NEW in Coal-Mining Equipment

Pipe Hanger Stays Put

A new hanger has been added to the Wedgtite series of pipe hangers by the Crouse-Hinds Co., Syracuse, N. Y. This device is designed to be attached to structural steel work by means of a toothed steel which, when driven into place, will not become loosened by either a direct pull or by vibration.

This hanger will take standard porcelain knob insulators, making it possible to run open wiring along structural steel work without drilling and tapping. This device can be used in mine galleries where the shoring consists of structural steel channels, I beams, angles or similar shapes.



Unaffected by Pull or Vibration

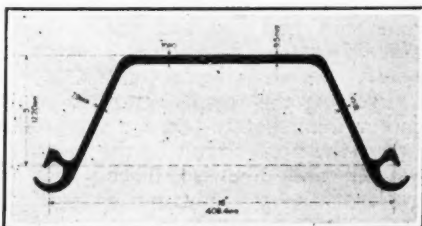
Type CHA hanger is made for either two or three-wire systems. The wires can be run in a direction either perpendicular to or parallel with the structural shape.

Deep-Arch Type Section Of Sheet Steel Piling

A deep-arch type section has been added to the line of Lackawanna steel sheet piling by the Bethlehem Steel Co. This section is designated as section No. DP165 and is characterized by the depth and shape of its arch construction.

The chief characteristics of the new section are: Nominal width, 16 in.; thickness of web, $\frac{3}{8}$ in.; weight per foot of pile, 33.3 lb.; weight per square foot of wall, 25 lb.; section modulus per foot of wall, single, 10.07; interlocked, 16.14.

Sketch of Deep-Arch Section



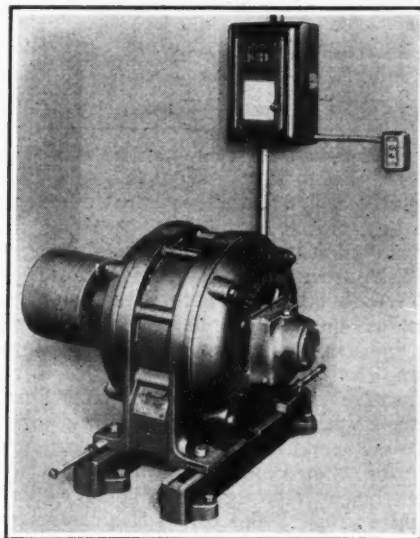
The new section is adapted for general use in types of construction where strength and light weight are of importance and where the piling is to be used permanently such as in the case of bulkheads, docks, retaining walls, wharves and similar structures.

The interlock is of the double-lock type, which is a well-known feature of Lackawanna piling.

Induction Motors Start On Full-Line Voltage

A line of squirrel-cage induction motors suitable for starting on full-line voltage is being placed on the market by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. These motors are normal-torque, high-reactance machines and will not draw starting current in excess of the limits recommended by the electrical apparatus committee of the National Electric Light Association.

They are built in ratings $7\frac{1}{2}$ to 30 hp.

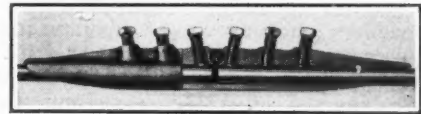


Simply for Service

600 to 3,600 r.p.m., low voltage, and are available with either sleeve or roller bearings. A magnetic switch with push-button control is the only starting equipment required.

This Splicer Is Stronger Than Wire It Holds

A trolley splicer announced by the Ohio Brass Co., Mansfield, Ohio, and designated as the MCM type, is said to have holding power in excess of the breaking strength of new wire. Set-screws placed at an angle cause the tension of the trolley wire to tighten the hold of the splicer. The wire is received in a straight line by this splicer



A Splice Without Adjustment

and does not require forming, which is so often necessary with other splicers. The design is such that arcing is reduced to a minimum. The splicer is easily applied. It is made of cast bronze and intended for use with 2-0, 4-0 and 6-0 round or grooved wire and 4-0 Fig. 8 wire.

Quick Finish to Dirt: Hypressure Jenny

A steam generator for the removal of paint, grease or dirt and for the thawing of ice from the interior and exterior of accessible and inaccessible chambers and surfaces has been placed on the market by the Homestead Valve Mfg. Co., Homestead, Pa.

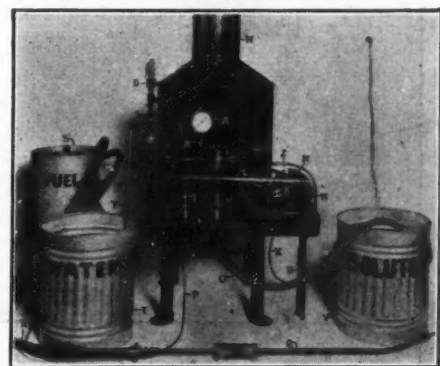
The unit, known as "Hypressure Jenny," consists of a 10-hp. boiler, heated by gasoline, natural gas or acetylene, which through a feed pump delivers hot water or steam under heavy pressure to a hose-connected nozzle. When gasoline is used as a fuel it is fed by a pump which together with the water pump operates automatically.

Pure water for thawing purposes or a solution of soap or some other compound for cleaning purposes may be passed through the system. The unit will develop a water-vapor pressure of 100 lb. in about one minute. It may be mounted on a small hand truck where portability is desired.

Hypressure Jenny has many uses in or about a mine. It will remove paint, grease, oil and dirt from any surface. Overhauling and small repair jobs in the shops are facilitated by the removal of grease and dust clinging to the parts needing attention.

The unit may readily be moved to the outside for the purpose of removing grease, dirt and other gritty material from portable mining equipment, such as locomotives, coal cutters and

Chases Grit, Grease, Dirt and Ice



What's NEW in Coal-Mining Equipment

loading machines, as a maintenance procedure. It will quickly clear fouled screen plates and is invaluable for the cleaning of gritty grease from the running gear of mine cars in need of repair.

Ice formation at the mouth of intake airways may be rapidly dispelled by this boiler unit. Troubles due to frozen track switches, ice-bound wheels on railroad cars, frozen water and air lines and ice-caked open ditches may be remedied without the building of open fires, which is a dangerous practice.

Makes 400-Mesh Screen

A wire cloth having 160,000 square openings per square inch has been produced by the Newark Wire Cloth Co., Newark, N. J. This is a 400-mesh wire cloth with 400 parallel wires per inch of width running each way at right angles. In a 2½-in. square of this cloth there are 1,000,000 square microscopic openings. Heretofore, according to the company, the finest wire cloth made in the United States has been 325 mesh.

Lacquer-Finish Jacks Come in 32 Sizes

A new line of screw jacks with improvements in design and finish, is announced by Templeton, Kenly & Co., Ltd., of Chicago. Instead of a solid frame, these jacks are built with an open handhole, permitting the screw of the jack to be visible at all times.

The carrying handle is an ingeniously formed portion of the manhole, being braced and ribbed, which adds strength to the jack. The screw and head are forged from one piece of steel. The standard and cap are made of refined gray iron to guard against cracking or chipping. The base is

The Screw Is in Sight

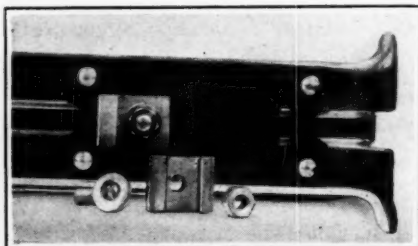


formed with an extra ribbing, providing stability and strength. The Duco lacquer or color finish, insures a clear and permanent color that will not rust or corrode.

Thirty-two sizes in all will comprise the line, embracing only the styles that are universally in demand. As an aid to more effective handling each distinct size is lacquered in a different color.

Copper-Steel Tie Meets Needs of Mine Use

After many years experimentation and testing under actual service conditions, the Keystone Metal Tie Corporation, 441 Lexington Ave., New York City, recently perfected a copper-steel tie applicable to all gages of tracks and to all weights of rail. These ties are partic-



Operations Made From Top of Tie

ularly designed for heavy main-haulage track service.

In addition to the many advantages inherent in steel construction, these ties have several outstanding features that make them particularly adaptable to mine use. They are all-rolled sections, and the use of copper-bearing steel reduces corrosion to a minimum. There are no holes or other weakening points in the section.

As shown in the illustration, the method of affixing the rail to the tie is quite simple. The rail is laid on the tie, bolts are inserted (head down) in the openings provided for this purpose and then slipped up to the side of the rail. Rolled clips which have a shoulder that fits into a slot in the tie, are then placed over the bolt, a lock washer is added and the nut turned down tight. This method of construction not only allows quick laying of track but also removes all strain from the bolt. Proof of the latter statement is found in tests recently made by a large railroad in which the rail bent at the web before rupture of any part of the tie took place.

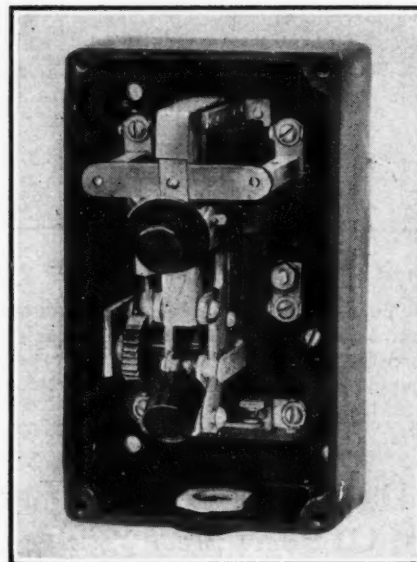
By using the proper clips, rails can be laid at any desired angle without necessitating any change in the tie structure or requiring the purchase of special ties for turnouts, crossovers, etc. The "whale-tail" ends prevent lateral movement of the track, and this, in conjunction with the sectional structure of the tie, virtually makes it an integral part of the roadbed—reducing maintenance cost, it is said, about 50 per cent.

Time-Delay Button Box Keeps Motor Running

A push-button station for use in preventing the cutting out of motors controlled by a magnetic starter, when there is a brief power disturbance, has been announced by the General Electric Co., Schenectady, N. Y.

It is to be used with standard magnetic starters, making it unnecessary, according to the manufacturer, to add time-delay attachments to the starters themselves. When power fails, the magnetic starter will drop out, but will also be caused to reclose upon the return of voltage by the push-button device. The equipment bears the designation CR-2940-BS-82-A.

In operation, pressing the "start" button closes the pilot circuit of the magnetic starter and the circuit of a coil in the push-button station. This coil when energized causes the "lift" plunger to rise. At the bottom of the plunger are spring-attached contacts



Acts When Power Fails

which are closed by the lifting action of the plunger.

When the voltage drops sufficiently to permit the coil to release the plunger the latter starts to fall but is retarded in its downward movement by a rack which turns a gear. The gear engages a ratchet and pendulum arrangement which serves as a timing mechanism. If power does not return before the time expires for which the device is set, then the contacts will be opened and both the coil and the magnetic starter will be disconnected until the "start" button is again pushed.

Pressing the "stop" button stops the motor immediately because this action opens the pilot circuit of the magnetic starter and likewise disengages the rack of the coil plunger so that the latter falls instantly.